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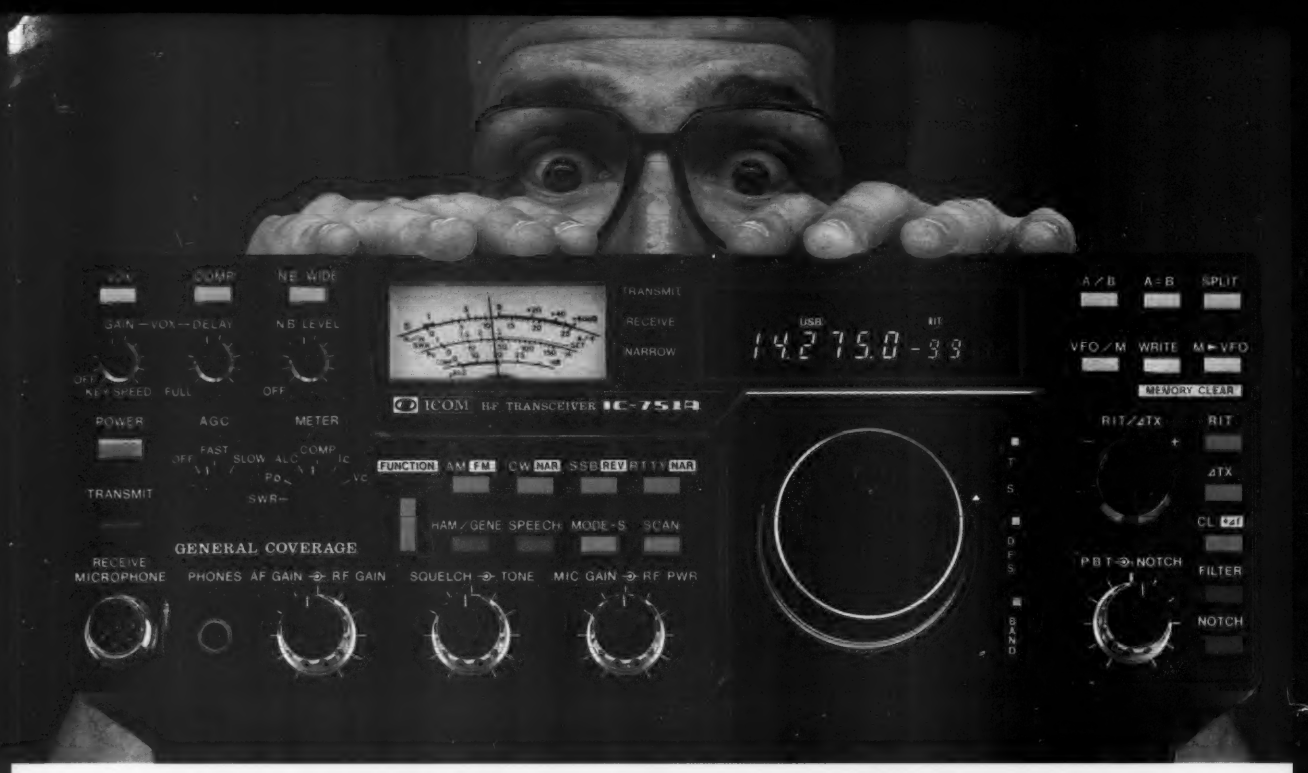

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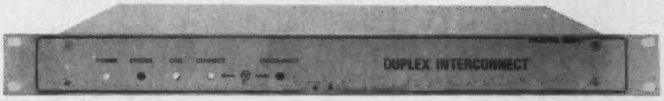

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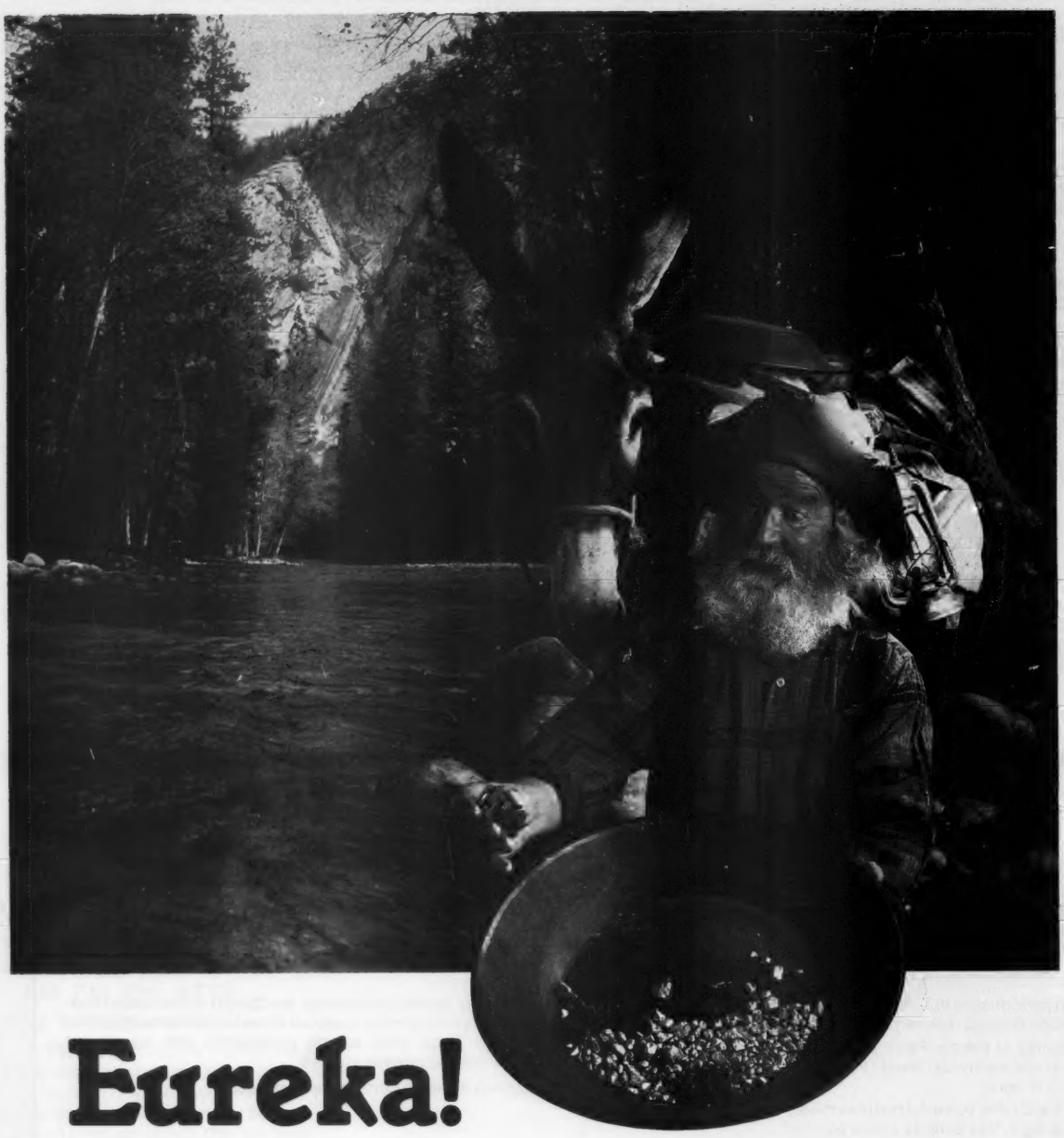

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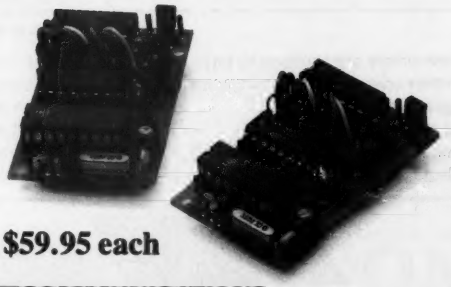

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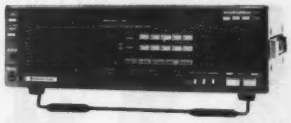
R-2000

TS-440S

NEVER SAY DIE

Number 18 on your Feedback card

D'JA SEE THE *NATIONAL GEOGRAPHIC*?

The October issue of *National Geographic* got me all excited—three new republics about to be formed in the Pacific! In case you're not an *NG* reader, the three new republics which are being made from U.S. trust territories which have been under the auspices of the U.N. are the Republic of Palau (Bilau), the Republic of the Marshall Islands, and the Federated States of Micronesia.

Presumably these three new countries will have to form their own FCCs to regulate communications and issue licenses. Presumably they'll have new call prefixes to go along with their new status. Presumably there will be the usual panic to get these worked and confirmed.

Also being formed is the Commonwealth of the Northern Mariana Islands, but I suspect this will be about as separate a country as Puerto Rico. It'll be the same in country status as before—probably with no call prefix change.

The article in *National Geographic* was vague on just when these trust territories would assume republic status—this hinges on a U.N. confirming vote. The countries have their new flags and are getting ready to be in business.

For the last two years I've been trying to work some time into my schedule to get to some of these islands—to do some DXing—take pictures and skin dive. I had in mind visiting Palau, Truk, Ponape, Majuro, and possibly Yap. It's a long time since I've been to any of those places.

During the war I got to Majuro for a couple of short vacations. Majuro is a large atoll made up of a ring of islands around a beautiful lagoon. Each of the islands had been given a girl's name—the submarine rest camp was on Myrna and the submarine tender there was the *Bushnell*, named after a great-great-grandfather of mine who invented one of the first submarines.

It was in the Majuro lagoon that I did my first skin diving, using a Momsen Lung which I'd converted. I was unable to convince anyone else to even try it. It was also on Majuro that I heard about Amelia Earhart and Fred Noonan crashing in the lagoon on their ill-fated flight to Howland Island—they and their plane were removed by the Japanese, who owned the islands at that time.

The submarine rest camp at Majuro was fine—you couldn't ask for a more beautiful spot with white sand beaches, an incredible lagoon, palm trees, and a perfect climate. We went there twice in 1944 for two-week rests while the tender repaired and updated our boat. Our barracks were in Quonset huts—there were movies every night—followed by gedunks (ice cream). When we arrived, the first order of the day was to get our mail—then our pay. This was followed closely by a flurry of poker games which moved most of the money into the more skillful hands. Those were some of the highest stakes poker games I've ever seen—except in the movies.

I remember when we arrived at Majuro for the second visit. Normally gambling wasn't allowed on the boat, but once we were tied up at Majuro the taboo seemed to be off and a 25¢ limit poker game sprang up in the crew's mess. Being normally a very lucky card player, I sat in. I've never had such a run of bad luck in my life—we played for about four hours and I didn't win one single hand. The only winnings I had were on side bets on who would have the worst hand—I did pretty well with

Continued on page 10

"Are you the handsome one who advertised for 'Ham Help'?"

QRM

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QRX . . .

EDITED BY PERRY DONHAM KW1O

Number 23 on your Feedback card

In Orbit

AMATEUR RADIO may soon have a permanent presence in space! Roy Neal K6DUE, Vern Riportella WA2LQQ, Bill Tynan W3XO, Larry Price W4RA, Dave Sumner K1ZZ, and NASA's Dr. Tony England W0ORE met recently to discuss the possibility of including a ham shack on board the U.S. manned space station due to fly in 1995. Three main functions will be stressed in a proposal to be submitted to NASA early next year: recreation, utilization, and education. The station will be used to give astronauts something to do in their spare time during their long months in space, and an "autopilot" mode is planned to allow the equipment to be used as a flying repeater (that way the system could be utilized when the astronauts are not using it, instead of just sitting idle on the shelf). The most exciting aspect of the project is education. One idea is to have a set of roving vans outfitted with communications gear which would periodically visit school classrooms. The students would get a chance to talk one-on-one with the scientists aboard the spacecraft; a one-way fast-scan downlink is also being considered so that the children can also see who they are talking to. The space station program is a result of President Reagan's 1984 directive to place a permanently manned platform in space.

Youngster

THE WESTLINK REPORT has announced the winner of the 1986 Young Ham of the Year competition. **Shawn Alan Wakefield WK5P** received the honor at the Ham/West convention in Las Vegas (thanks to Yaesu for picking up Shawn's air fare and hotel bill). At the banquet, *Westlink* Editor Bill Pasternak WA6ITF cited Shawn's outstanding contributions to the hobby, including the formation of a ham radio Explorer's Post and the creation of a ham club at his high school. Shawn is 16 years old; with a record like his, the future looks bright.

Camp Kudos

THE DAYTON AMATEUR RADIO ASSOCIATION went to camp this summer. **John McCoy NS8A**, backed by DARA, spent six weeks at Camp Kern, a branch of the Dayton YMCA, introducing youngsters to the excitement of ham radio. Equipment was donated by ICOM, Moseley, and Butternut, and a complete HF/VHF/packet station was set up in an old bath house. The original DARA plan was to demonstrate ham radio to the campers, then contact them after the summer to enroll them in classes. John, however, decided to go full bore and encouraged the kids to earn their Novice license in one week! The result? Seven new Novices in the first one-week session, with 13 more licensed in the remaining five sessions. The sixteen boys and four girls ranged in age from nine to fourteen years old. John says that the biggest problem was answering the children's questions ("What's a hernia operation?") and finding interesting people to talk to on the air. It was also a bit difficult, he says, to explain to the kids that they had to learn Morse code . . . especially when the packet station across the room was spewing out error-free data at 1200 baud. Would he do it again? Yes! In fact, next year's plans include expanding the program to two more camps.

Kids at Camp Kern crowd around the operating position.

Rumor Or Fact?

WE MIGHT AS WELL confirm the rumors that have been floating around concerning a new DX award . . . look for an official announcement and rules for *73*'s version of DXCC in the January, 1987, issue! Here are a few tidbits to whet your palate: Nearly 400 countries are on the list (ARRL's DXCC has just over 300); everybody starts at zero on January 1st; there won't be a big headache with card-checking; about twenty special endorsements are available. This award is the one to shoot for!

Is It Art?

THE ARRL is sponsoring a national art contest for students. First, second, and third prizes will be awarded in three age categories (8–12, 13–15, and 16–18), and the winning entries will be sent along to a worldwide competition sponsored by the ITU in Geneva. The theme of the contest is "Youth In Amateur Radio." The judges are looking for original art depicting the student's impression of ham radio in a photograph, drawing, painting, or illustration. Artwork should be no larger than 11 x 14 inches, and must be accompanied by an official entry form. Each entrant must be sponsored by an ARRL member—a list of sponsors and copies of the entry form are available by writing to the ARRL, Department Y, 225 Main Street, Newington CT 06111. The deadline for entries is February 1, 1987.

Stoner Stoned

THE FCC has said "no" to Don Stoner's **Public Digital Radio Service.** Stoner wanted to put a no-code, low-power packet service on a portion of the amateur six-meter band (52–54 MHz). Don's system went to great extremes to avoid interference to television reception, including smart controllers that would automatically reduce the transmitter's power to the minimum level necessary for communication (we need that on 20 meters!). The biggest stumbling block to Don's request is an agreement at WARC-79 that the spectrum from 50 to 54 MHz would be exclusively allocated to hams in Region 2. In dismissing the petition, the commission suggested that another home be found for the PDRS, possibly at 900 MHz. Our 902–928-MHz allocation is not exclusively amateur. I think that the FCC is being very positive about the creation of this new service, and a PDRS should become a reality once the technical details can be worked out.

Exams Examined

NOW THAT the volunteer examiner system has proven itself, the FCC is looking toward getting out of the examination business completely. In a recent Notice of Inquiry (FCC 86-400), the commission proposes handing over commercial radio operator examinations to the private sector. This would save the FCC money and provide more testing opportunities. Comments are being solicited regarding whether handing over commercial testing is a good idea, and if so, how examiners should be picked and funded; send your comments to the FCC, 1919 M Street NW, Washington DC 20554.

Test Tip

IT'S NEARLY TIME for another edition of the popular *73* World SSB Championships, scheduled for January. Now is the time to send off for your official log sheets—drop an SASE in the mail to Bill Gosney KE7C, World Championship Contests, 2665 North Busby Road, Oak Harbor WA 98277. You'll find the results of the 1986 160- and 75-meter contests starting on page 50 of this issue.

House Hams

AN INTERESTING CONCEPT has been put forth by **Jim McNalley** in a working paper released by the FCC's Office of Plans and Policy. Jim suggests that it would be nice to allow members of a household to use ham equipment to communicate with the station licensee when he or she is mobile or portable. In other words, you could chat with your wife on two meters while you were driving home, even if she doesn't have a license. Communications would be identified by the station call. Jim feels that such a modification to amateur radio would increase the value and popularity of the service, and that the ham community could exercise enough discipline to keep the operation clean. This isn't an NPRM or NOI or anything official; it's just someone at the OPP blue-skying. We certainly should give it some thought, though, and we'd like you to drop *73* a note telling us whether or not you think it is a good idea. The address is *73* Magazine, WGE Center, Peterborough NH 03458, Att: OPP.

Culled Calls

HERE'S SOME MORE INFORMATION on the proposal to allow hams to choose their own callsigns. Basically, the FCC has decided that it would be no trouble at all to let an outside organization issue "special" calls. The commission would still issue a callsign to each licensed amateur; you then would have the choice of using that call or applying for a special one. There haven't been any firm proposals submitted yet, but tentative plans have calls costing between $20 and $30. Priority would be given to requests for calls that were lost due to a move into a different area (remember when you had to do that?), and requests for calls of Silent Keys by a family member or memorial station. One hitch in the idea is that the FCC would like to spread the responsibility among several groups (similar to the VEC program). This certainly complicates record keeping—all of the organizations would have to share a data base. Also, the League has indicated that they are interested in issuing callsigns *only* if they have exclusive authority, something that may not be legal under antitrust law.

ECPA Passes

AMIDST A BIT OF CONFUSION, the Senate has passed the Electronic Communications Privacy Act. The ECPA was tacked on to a drug-abuse program bill that passed easily. However, there is some concern about the method used to get the ECPA through Congress—specifically, a report must be issued by the House Judiciary Committee before it can be sent to President Reagan for his signature. The Act is much different from the version first proposed, which sought to make illegal reception of just about every common-carrier radio service. The ECPA passed by the Senate makes legal the reception of cordless telephones, pagers, marine and aeronautical communication, ham, CB, GMRS, government, law enforcement, police, and fire transmissions. About the only thing that it is illegal to listen to is cellular telephones. It's nice to see the Act toned down, but I still think that any restriction on reception of radio signals is a violation of a fundamental right. Is it time for a bit of civil disobedience?

Found, Fined

I KNOW I PROMISED not to mention Herb Schoenbohm KV4FZ for a while, but his name popped up in connection with a recent FCC raid in the Caribbean. Acting on several complaints from hams, engineers from the San Juan field office tracked down **David Ackley W4UWH** on St. Thomas, who was intentionally interfering with a net on 40 meters (doubly bad since David has a Technician-class license). Herb's name comes up because Ackley was retransmitting taped recordings of KV4FZ. W4UWH was fined $1,450 for his violations.

Aloha

THANKS to our friends at *The Westlink Report*, *Amateur Satellite Report*, and *The W5YI Report* for help with this month's QRX. Also, since it's that time of year (again!), best wishes for a safe and happy holiday season.

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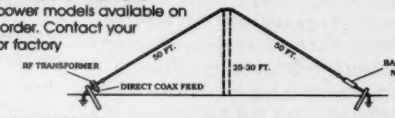

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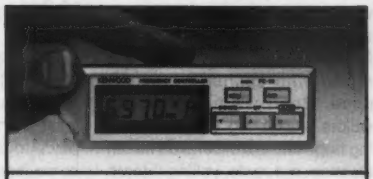

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NEVER SAY DIE

from page 4

that. So, even with the quarter limit, I found myself out a couple hundred dollars—a month's pay. I went to the next table where a crap game was going and won it all back (and more) in about two minutes.

You can tell me all you want about there not being any luck in gambling—it's statistically impossible to lose for four hours. No, no one was cheating.

Another sport at Majuro was making Gilly. When our crew went ashore they took along the coffee urn, complete with the special insides made by our machinists so it would distill torpedo (denatured) alcohol into a slightly less deadly fluid we called Gilly, which was mixed with canned grapefruit juice. Soon we had drunken sailors staggering around throwing huge chunks of coral on the tin Quonset hut roofs, yelling "depth charge!"

It'd be fun to get back and see Majuro again. I'm sure nothing is left of the rest camp on Myrna, just as there wasn't a sign of Camp Dealey on Guam—only a gas station with the name.

I'd enjoy visiting Palau and Yap, too. The last time I was there we had to stay about a mile offshore in our submarine. We did lifeguard duty at Yap when Navy aircraft raided it. We chugged around on the surface watching for any downed American planes. The Japanese planes, frustrated by the number of American planes attacking Yap, left them alone and took their frustration out on us, a safer target. They strafed us and then bombed us, forcing us to dive. One bullet hit the hull right above my head where I was sitting in the crew's mess just before we dove.

We spent a good deal of time circling Palau, so I'd like to get there and see what I missed 42 years ago. I don't know just what it'll cost to visit these islands, but I'm sure it won't be very expensive. Are there any of you who have some time and can afford a short island-hopping trip like that with me? It'd be a lot more fun with two or three fellow hams than alone. It'd be a trip you'd never forget.

Micronesian Airlines gets to all these islands, so it's not difficult to get around. Most of 'em have at least a small hotel, so there's a place to stay. I'll bet we can find some local hams who will be delighted to help make our visit fun. Heck, we might not even have to carry hundreds of pounds of ham gear and take the time and work to get it all set up.

Amateurs in rare spots are always delighted when someone comes in and works the pileups for them—as long as they handle the QSLs too and don't cause the local hams the trouble and expense of cleaning up after 'em with QSL cards. Many hams in rare spots do all they can to avoid the QSL chores brought on by the thousands of hams who have no interest in them personally, but just want a new country confirmation. It's a royal pain in the ass for most hams in rare spots.

QSL managers help some, but that doesn't get you out of pileups and breakers frantic to get your card. It's almost impossible to have a normal contact with anyone, a factor which often drives operators in rare countries off the air entirely. Imagine if all you could ever make were contest type contacts! Imagine if every time you tried to actually talk with someone you got breakers who were increasingly nasty about getting a contact before the band conditions changed. Is it any wonder ops in rare countries get fed up in short order? Perhaps you can understand why ops in rare spots are so anxious to have visitors come in and work the bands to take off some of the heat.

Of course, as DXers know, the heat doesn't stay off for long. We seem to be able to generate more DXers spontaneously, so no matter how worked out a rare country may be, a few months later there are pileups again.

Until you've worked the business end of the pileups you don't really get the excitement of amateur radio. Sure, it gets old after a while, as does almost any excitement, but for the short run there's little in amateur radio to compare with the kick of operating from some really wanted country. Heady stuff.

My first experience with this was back in 1958 when six of us went to Navassa Island and put KC4AF on the air. We operated around the clock for a few days and had the time of our lives. Half of the chaps on the trip smoked, so they're no longer alive. Navassa was a tiny, uninhabited island off the coast of Haiti—belonged to the U.S., hence the KC4 call.

We all drove to Miami, took our rigs, generators, antennas and towers on a cargo ship to Nassau in the Bahamas, where we hired a motor-sailer ship which took us down to Navassa. It was one hell of a trip down, with us going through the edges of a hurricane. Navassa has no beaches—the only way you can get on the island is by climbing up the sheer cliff using a hanging ladder put there for occasional Coast Guard visits. It's a trip of a lifetime.

One trip to Navassa is enough for even the most dedicated DXpedition fanatic—it's one of the tougher places to get to in the world. Naturally, I went there again in 1973 with another group

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

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Stuart Norwood

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Perry Donham KW1O
MANAGING EDITOR
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PRODUCTION EDITOR
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INTERNATIONAL EDITOR
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Editorial Offices
WGE Center
Peterborough, NH 03458-1194
603-525-4201

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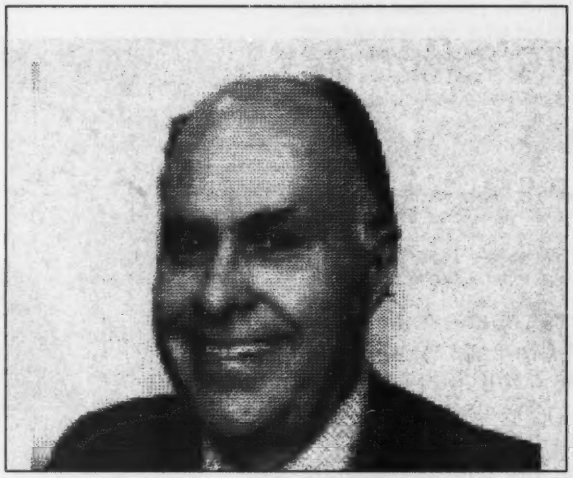
and operated as KC4DX. I'm a sucker for adventure.

Operating from the new Pacific republics won't be quite as adventurous as Navassa, but I know the pileups will be record breaking. If you don't know how to handle 'em when you go there, you'll be an expert when you get back. Perhaps I should give some lessons. I've operated from a lot of rare spots—let's see, some of the rarer places I've activated were Kenya, Lebanon, Syria, Iran, India, Nepal, New Caledonia, Fiji, Wake Island, Philippines, Sabah, Sarawak, Western Samoa, American Samoa, Tahiti, Jordan, Thailand, South Korea, Swaziland, and Lesotho.

If there are some of you readers interested in visiting the new republics and putting them on the air for a while, let me know and I'll start putting together a DXpedition. Of course, I suppose some group will want to grab "the glory" and go there first. How glory has any real meaning in the small world of amateur radio, I'm not sure. To me it's the fun of going there and working the pileups. I really don't care if I'm first or fifth, so if there are some fanatics to whom this is really important—first I suggest investing in a psychological evaluation of your sanity...which I know you will fail. There's no glory in amateur radio, just fun to be had.



Would you buy a used Wouff-Hong from this man?

The hams who sit around anxiously waiting for emergencies so they will have a crack at becoming famous by winning an award for their emergency work have things all out of balance. We should set up to handle emergencies because we enjoy doing it. We should work DX because we enjoy it—and not be willing to kill in order to move up one line in a listing in *QST*. St. Peter does not read *QST*—I hope that doesn't shatter your whole world. I'd even suggest that God doesn't read *QST*, but I know a lot of DXers who place *QST* way above the Bible wouldn't believe me.

So, are you going to face up to your responsibilities as a ham? Are you going to stop taking all the time and start giving for a change? Isn't it time you started making amateur radio more fun for others instead of making so many other DXers miserable with your incessant breaking in and calling in pileups? You know as well as I that you are illegal when you're doing that. You know it's against the LAW to intentionally interfere with other radio signals—and that is precisely what you are doing in a pileup. Don't you try and weasel with that wide-eyed innocence of yours telling me you didn't know anyone else was on the frequency. You did so know and you maliciously stomped all of 'em. That's deliberate and malicious interference.

You say you haven't the time for a trip? Hogwash! Of course you have. You have the time to do anything you really want to. If you've gotten yourself tied to a job where you can't get away now and then when you want, you should start thinking in terms of going into business for yourself. Hey, you only get one run through this life—and the years are going by faster and faster. If you don't get horsed around to where you can get away

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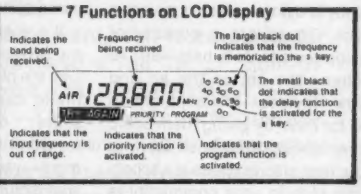
AIR		108 - 136 MHz	25 kHz
FM		76 - 108 MHz	50 kHz
AM	SW	1601 - 2194 kHz (1603 - 2194 kHz)	1 kHz
	MW	530 - 1600 kHz (531 - 1602 kHz)	10 kHz (9 kHz)
	LW	150 - 529 kHz (150 - 530 kHz)	1 kHz

7 Functions on LCD Display


Indicates the band being received.
Frequency being received
The large black dot indicates that the frequency is memorized to the 3 key.
AIR 128.800
The small black dot indicates that the delay function is activated for the 8 key.
PRIORITY PROGRAM
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Indicates that the priority function is activated.
Indicates that the program function is activated.

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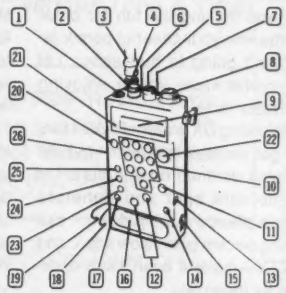

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for a week or two to get to Palau or some place with me, it's time to start getting your. . . er. . . stuff together.

I guarantee you don't know many people (any, actually) who are busier than me. Yet I can get away when I make up my mind to do it. I manage to go on the two-week Asian electronic show tour every October. I get away for a few days of skiing every January (and you're welcome to join me if you've got an HT and the time). I get away for a skin diving trip in the summer. I also have been getting to a lot of hamfests and conventions—and still I've managed to run my businesses—perhaps not as well as I could if I didn't do anything else, but the trade-off is fine.

I tried to get you to come with me this October on a DXpedition to Korea, Taiwan, Hong Kong, Sabah, Brunei, and Sarawak. After writing about it for months I had maybe a half dozen hams who felt they could afford the time and money for the trip—not enough to make it feasible. That's pitiful. I should have had a hundred or more queued up wanting to go. I guarantee you that if I proposed anything like that in Japan I'd have a hundred—probably more like 500—anxious to go.

We're not going to get amateur radio back to life and fun unless we're all having fun. Right now the hobby is dying—which is no news flash. There are a number of things you can do to help—as I've written—like get on the air and work Novices—make hamming fun for them by giving them some entertaining contacts. Getting your ham club to sponsor a school radio club in your community is another big winner. Getting on the air and making life fun for other hams with your cheerful personality isn't going to hurt either. Let everyone know you're enjoying amateur radio.

Working DX is a whole lot of fun, so get yourself into gear—get out of your damned rut and hie off to some rare spot and generate some pileups to whip down. Take along packet gear, slow scan, and RTTY—make it even more exciting for these ops.

Now, are we going to the Pacific and have a ball or are you going to just sit there and grumble?

PICTURE THIS!

If you're looking for a way to get into business on the semi-cheap, I ran across a nice scam—making computer printout photos. It's not a new dodge, but this is the first system I've seen which spurts out full-color pictures (see my photo, page 12). They've had black and whites for around ten years now.

The first computer photo printing systems were quite expensive, requiring a minicomputer for power. They did a land office business. Then it got so you could do the same work with a microcomputer at a fraction of the investment, so systems proliferated, killing the market.

"There are hundreds of hams whose perspective is so incredibly distorted that they actually believe it makes a difference whether they've worked 320 or 321 countries."

Around three or four years ago I remember Tuft's Electronics using an Apple II at Dayton to print stuff on hats—that's where the hat you've seen me wearing on the cover and in subscription ads was made. They did T-shirts with the same system.

It's possible this business can be revived with color pictures. Like the black and white printouts, these can be imprinted on T-shirts. . . or whatever. It's too bad we don't use handkerchiefs any more—you could send one with your picture on it to your friends so they could wipe their nose on you. Maybe there's a market for photo toilet paper? I'll bet I could sell tons of Kaddafi's pictures this way. And never mind what picture would sell best at ARRL HQ.

At any rate, if you live where you think you might be able to keep something like this going—in a busy mall—at exhibitions—hamfests—the whole outfit costs about $15,000. That includes the Apple II, disk drive, color monitor, video camera, photoflash and parasol, color printer, control unit, and heated shirt press.

If business gets out of hand, the system is expandable to two printers, a tape storage system for the freeze-frame pictures, and so on.

This looks like a nice spare-time business. The operating expenses are minimal, so mostly you have to make enough to pay for your hardware investment. If you put $3,000 down and borrow $12,000 from the bank at 10% you've got an overhead of around $600 a month for two years to pay off the works. Thus, if you clear $3 per picture, including your time, you've got to sell about 200 pictures a month to break even. If you only work 20 evenings a month the first ten pictures a day will pay off the system. . . the rest is gravy.

Whoa! I'm not suggesting you rush out and buy a computerized color printing outfit and make a bundle, though that isn't a bad idea. I'm more pointing out that there are a thousand ways to make money if you keep your eyes open for 'em. Keep your imagination honed. I spotted this system at the Consumer Electronic Show in Chicago in June. Maybe, if it isn't too tough a trip for you, it would be worth your while to get to the next one in Las Vegas, January 8–11.

Right after CES I usually stop off in Colorado for a few days of skiing with a group of ham industry people. . . if you've got an HT and would like to, join us the 13–18. This January ham industry conference has been going on for over ten years now.

If you'd like more information on the computer color printing stuff, drop me a line and I'll point you in the right direction.

COUNTRY HEAVEN IN '87

One of the biggest beefs I get about the ARRL has to do with their autocratic decisions on what is or what is not a country for their DXCC award. I'm afraid I have a problem with getting uptight over this obviously major difficulty.

Yes, I know, there are hundreds of hams whose perspective is so incredibly distorted that they actually believe it makes a difference whether they've worked 320 or 321 countries. I've known fanatic DXers to spend a thousand dollars in order to make sure they could keep up with their brethern on the Honor Roll when they get a new one.

Indeed, one of the brighter DXpeditioners charged whatever the market would bear to provide contacts for the top guns on the Honor Roll. He bragged he was making over $50,000 a year—with no taxes since it was all in "donations" and there was no way for the IRS to find out how much he was making.

I remember when he signed a call of a brand new country—Spratly Island, as I recall—where he purposely couldn't hear the top guns who hadn't paid his demands, thereby shuffling the top end of the Honor Roll and generating enormous consternation. Some DXers called him solid for a week, 24-hours a day, without connecting. Later investigations seemed to put him as actually operating from northern Thailand, but the League accepted the Spratly QSLs anyway.

His best DXpedition was from Heard Island in the South Indian Ocean. It appears as if he actually operated this one from just north of Vancouver.

Hmmm, I digress—wonder how that happened? Oh, I was making a point about the cosmic uselessness of getting emotionally involved with DXCC and other such awards. If they're fun—fine. If you start finding you are hooked—are staying home from work to get a new country or some such nonsense, hey. . . this is a hobby! Fun, not desperation, is the name of the game.

Now, in order to make things even more fun, I've decided to solve once and for all the problem of deciding what is or what is not a country. I've figured out how to make this a non-problem. How would you like a country award where there are 396 countries? I'm not talking about my deciding what is or what is not a country—not even establishing a DX Country Committee with an Awards Chairman to flog. I'm talking 396 actual legitimate countries for you to chase.

It's this way. First we start with the 320 or so the ARRL accepts. . . and no rude remarks about them being tight-assed about accepting new countries. That's a fine start, but it leaves out a lot of countries which other International Amateur Radio Union (IARU) national amateur radio societies accept. I don't see why the League should have all the votes in the IARU on country counts.

So I set our Perry Donham KW1O loose on getting lists of accepted countries from all of the IARU member societies. These are all national amateur radio societies, so presumably each has the intelligence and the resources to know about such things. When we looked into it we found that the REF (France) had some territories which they accepted as countries,

Continued on page 78

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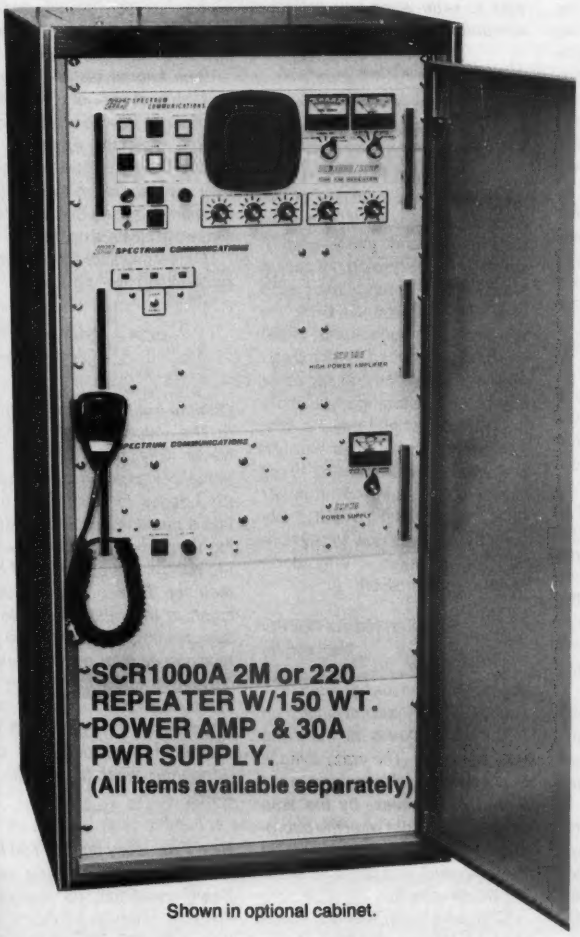

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HAVE A NICE DAY

I must respond to the "Thumbs Down" letter by "Name withheld" in the October, 1986, issue. As soon as I read it, it hit me that people like this guy are a big reason that I am not a ham.

For the last 20 years I have been listening to the ham bands on my shortwave radio. When I was younger I found it very interesting to listen in on two old-timers talking about the good old days. Now that I am older I can go sit in any bar and listen to old-timers talking about how great it was to buy gas for 15¢ a gallon (they forget that they made $2 a day at the time).

In the last five years I have noticed that ham conversations are more like this:

Ham 1: "Gotta go, I'm at work now."

Ham 2: "Yea, Ham 1, you get to work so you can pay Social Security so I can get my check."

Ham 3: "Yep, we've got to get our check."

Ham 4: "73, Ham 1, I've got to scrub my dentures and then go to the doctor again for my bad back."

Then I read this letter in your magazine from some old coot who calls himself a dumb bastard. He says, "Do you really think a Novice or pre-Novice could understand one single word?"

This guy is obviously in the denture crowd. I have friends I have been trying to talk into getting their ham ticket for years. Almost every time I bring up the subject of ham radio, these people don't want to know anything about it or they ask, "Is that like CB?" They ask why you should talk around the world on a noisy radio when a phone call will get through every time. Good question. Why would you?

Nobody wants to learn the Morse code; my computer friends laugh when I suggest it. Do the hams out there really think anybody wants to build crystal radio sets and sit around drinking coffee all day, waiting for some guy to come on from DX-land?

People have money to spend; not everyone is on a fixed income like you hams. This is what people outside ham radio are planning: We are going to take away your bands. Not just 220, but any band we want. We are going to use the ham bands mainly for computer use and for personal communications. Who is going to stop us? Certainly not a lot of fat old farts with high blood pressure who still think that there is such a thing as a pre-Novice, implying that you don't know anything about electronics if you're not a ham.

What's to stop me from buying a radio and transmitting with my computer right now? I can say with confidence that 99% of you hams pose no threat to us non-hams who ARE going to take away your bands and put them to good use. We will let you bitch and moan about your problems over the CB.

You hams are a disgrace to the human race. I have gone to many hamfests around the state and can honestly say that I have never seen a bunch of bigger slobs anywhere. Most of you are fat, smoke cigarettes, use no deodorant, and are just a plain bunch of nerds.

I am also into motorcycles; at swap meets for bikes we have fun. There are lots of good-looking women into bikes. How many foxes were at your last hamfest?

We non-hams are not going to sit back and watch a bunch of fat old nerds sit back and hide from life in their radio rooms much longer. We were willing to give the no-code license a try, but now that's out and we're mad and tired of waiting around for you guys to die off.

We have the money, the vast numbers of people, our health, and energy to devote to the cause of using the airwaves for the public good.

This is America, where the majority rules! Hams are old news and have stayed on the air too long, cluttering up useful frequency space that can and will be put to good use.

Mad in Madison WI

If you're going to hamfests solely to pick up "foxes," you're definitely going to be disappointed. Try a personal ad: "Healthy, prosperous SWM with lots of energy seeks fox for public good." That will take care of your fox problem.

Why don't you pick a callsign and get on the air as a pirate. It's no big deal—quite a few folks I know started their ham career with a bogus call (including W2NSD). I used to bootleg as K9TNV very successfully, except for the time I ended up in the Canadian phone band. You can have great fun if you choose a call from a rare DX spot and run about 5 Watts into a dipole. You could even have some QSL cards printed up (see our ad on page 65).

It's obvious that ham radio scares you—otherwise you'd be on the air instead of writing juvenile letters like this one. Or maybe it's hams that scare you—are you afraid that if you're found out they'll make you stop bathing? Be sure to write when you get your computer hooked up. . .—KW1O.

LANGUAGE BARRIER

With regard to KW1O's response to the criticism of the August packet issue ("Trust me, they understand every word"): I was recently showing my packet station to a young man who now runs a telephone BBS. He seemed to understand 1200 baud, checksum, RS-232 interface, and serial port and appeared interested in learning more about packet. So I let him make a connection on packet. The ham on the other end started using terms like "FB OM" and "What is UR QTH TX FR QSO 73 CUL." My young friend was now totally confused and asked, "Why don't hams speak English?"

Earl Morris N8ERO
Midland MI

I've often asked that question myself! Using CW abbreviations on RTTY and packet is the mark of a poor operator. The crazy thing is that it ends up taking longer to get a message across; by the time you've figured out what the abbreviation is and found the letters on the keyboard, you could've typed the whole word in.

Q signals I can tolerate, since they have become words in our vocabulary (yes, you can use them on phone, too). But if I hear you using "MX ES HNY" on packet when you mean "Merry Christmas and Happy New Year," I will personally come and stick a pin in your coax.

You should, however, continue to use "73" whenever possible during your conversations. —KW1O.

MUSEUM OR MORGUE?

I'm certain that you didn't miss the editorials in *CQ* and *Ham Radio* blasting the ARRL about their "monument to the past." The League is spending several million dollars on it, plus diverting manpower to a project that is ludicrous in the light of a decreasing ham population.

Maybe the ARRL does see the handwriting on the wall and wants to get the project completed before amateur radio dies and it can be buried in a mausoleum. Frankly, I had expected to see about six pages in Never Say Die on this subject, but I guess you have selected a more appropriate time for an exclusive issue.

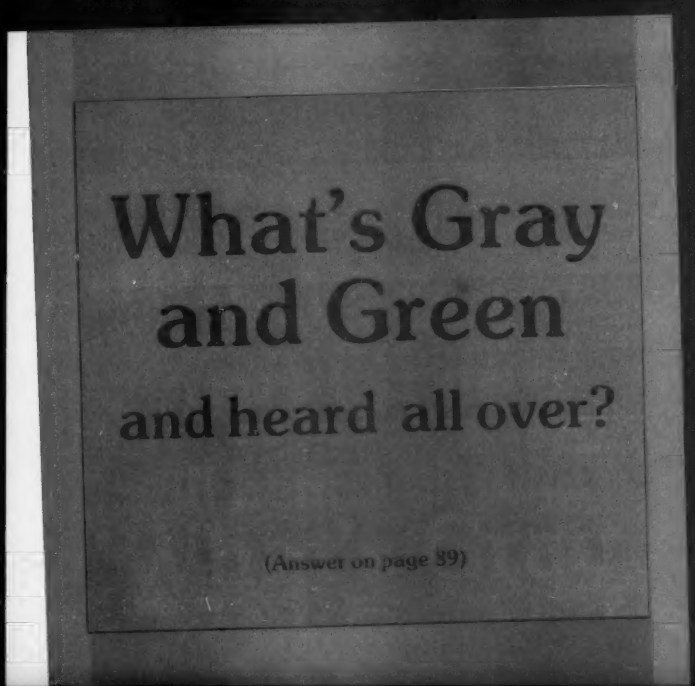
Your August issue on packet was the best yet—and I feel there is a need to devote more space to packet projects. Amateurs are buying TNCs fast and furious and they are generating lots of questions on operation that are not answered in NK6K's column.

Until I move back to New Hampshire—keep fighting.

John J. Mitchell W1GSM
South Bend IN

Quoting from "Throw Yourself Into The Volcano" in November's Never Say Die: "I'll bet you thought I was going to be critical of the League for putting so much into a museum instead of investing it in promoting the growth of the hobby. Nope, not me. I think they see amateur radio about to crash in the near future, so the best possible investment will be a museum so later generations will be able to know there once was something called amateur radio. Good move. I've got some first-class stuff I might donate. . . been wondering what to do with it." —Eds.

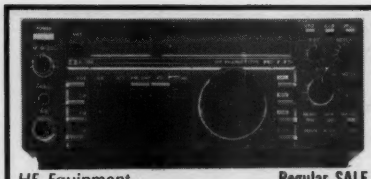
Nice idea, lousy timing. You have to wonder what's going on at Board meetings; do they even consider what the implications of their actions are? Or do the Directors just vote for something because it sounds neat, or because their friend is backing it? It certainly seems that way this time. Perhaps there should be a mandatory cooling-off period, say 30 days, between the introduction of a proposal and the vote on it. That should be plenty of time for the Directors to come up with an original thought or two. . .—KW1O.


What's Gray
and Green
and heard all over?
(Answer on page 89)

What's Gray and Green

and heard all over?

(Answer on page 89)



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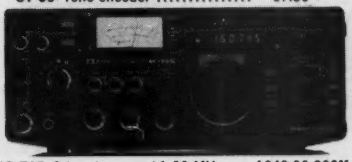

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IC-37A Compact 25W 220 FM, TTP mic	499.00	**439.95**
IC-47A Compact 25W 440 FM, TTP mic	549.00	**489.95**
PS-45 Compact 8A power supply	139.00	**129.95**
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
IC-28A 25W 2m FM, UP/DN mic	429.00	**379.95**
IC-28H 45W 2m FM, UP/DN mic	459.00	**399.95**
IC-38A 25W 220 FM	459.00	**399.95**
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NEW PRODUCTS

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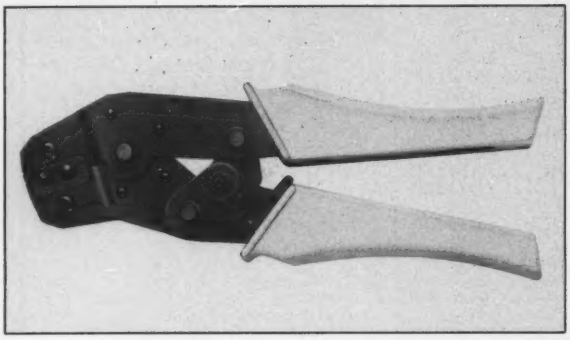


Xcelite's one-handed crimping tool.

XCELITE CRIMPER

Crimping tools designed for one-handed operation are available from the Xcelite division of the Cooper Group. The force needed for crimping is 36 pounds, compared to the 70 pounds required in most other tools. The crimpers are made of high-quality steel and they have been life tested to 50,000 operations. The tools feature a ratchet which guarantees consistent crimping force and a one-finger release mechanism.

For more information, please check Reader Service number 201.

ESP MODEM PROTECTION

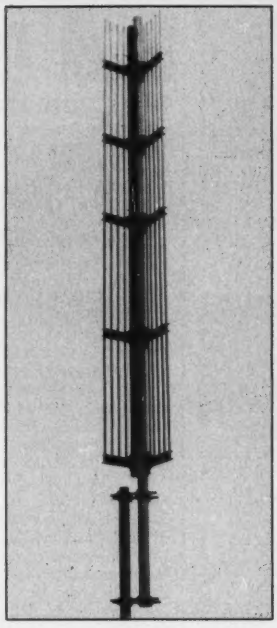
Electronic Specialists has added modem protection to their Kleen Line series of transient suppressors. The PDS-11 uses gas discharge tubes to suppress telephone line spikes caused by lightning, electrical noise, or central switching systems. An isolated ground is provided to protect equipment even further. The PDS-11 is set up for a standard 4-pin modular telephone connector; suppression is on the red and green line, with the yellow and black line run straight through.

For complete details on the Kleen Line series, please check Reader Service number 202.

CELLULAR SECTOR ANTENNAS

Two new 800-MHz 60° sector antennas designed for both wireline and non-wireline systems are now available from Antenna Specialists. The 17-dB gain antennas provide a 55-MHz bandwidth, allowing full duplex operation in sector-to-sector cell sites. The antennas are ruggedly constructed with extensive welding of connections to minimize noise and provide maximum reliability. Rated at 500 Watts, the antennas exhibit a 25-dB front-to-back ratio with a vertical beamwidth of 7.5°. Model ASPE963 covers 825–880 MHz, and model ASPF963 covers 835–890 MHz.

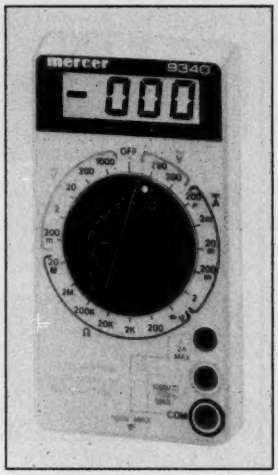
For detailed specifications, check Reader Service number 203.



Antenna Specialists' ASPE963 800-MHz antenna.

MERCER MINI DMM

Mercer Electronics, a division of Simpson Electric, has announced a pocket digital multimeter that weighs less than half a pound. The model 9340 ($44) is housed in a high-impact, high-visibility yellow case and measures up to 1,000 V dc (five ranges), 750 V ac (two ranges), 20 megohms (six ranges), and 2 Amps dc (five ranges). An audible continuity checker and a diode-test position are also included. The 9340 comes with a 9-V battery, color-coded test leads, and an operator's manual.



Mercer's model 9340 pocket DMM.

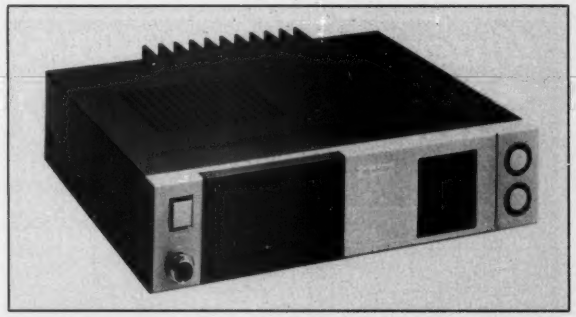
For more information about the model 9340 pocket DMM, check Reader Service number 210.

STANDARD RP70K

Standard Communications is now marketing an 800-MHz version of their RP70 desktop repeater/base station. The RP70K features full-duplex operation in either base station or repeater mode with power output adjustable from 5 to 15 Watts. Up to two CTCSS encoder/decoders may be added as options, providing the user with two private channels. Other features include a time-out timer, phone patch capability, and a backup 13.8-V-dc battery with automatic power-failure switch-over.

For more information, please check Reader Service number 205.

Kleen Line modem protection from ESP.



Standard's RP70K base station/repeater.

Sony's ICF-2010 general-coverage receiver.

SONY ICF-2010

Sony's feature-packed ICF-2010 PLL synthesized receiver includes dual PLL quartz frequency synthesis, synchronous detection circuitry, a switchable i-f bandwidth, 32 memories with memory scanning, automatic scan tuning, direct keyboard entry, and a built-in quartz clock with a timer. The ICF-2010 covers 150 kHz to 29.999 MHz (AM), 76–108 MHz (FM), and 116–136 MHz (air band).

For complete details, check Reader Service number 206.

TRIO CODE-PRO

PC Code-Pro and Mac Code-Pro are two new products available from Trio Technology. The programs help you to learn Morse code or improve your code proficiency. Code is sent in continuous or five-character random groups from 5 to 40 wpm with selectable character spacing. PC Code-Pro runs on any IBM PC-compatible, and Mac Code-Pro is the Macintosh version.

For more details, please check Reader Service number 204.

SAMS HAM SOFTWARE

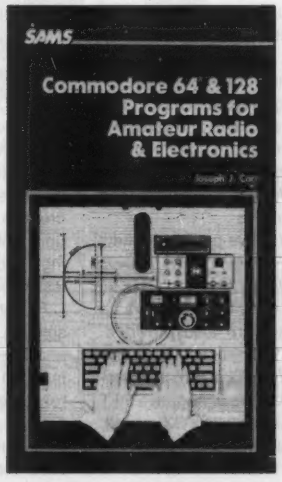
Howard Sams books has published *Commodore 64® & 128® Programs for Amateur Radio & Electronics* by Joseph Carr. The book includes 42 programs covering antenna calculations, swr, transmission lines, impedance-matching networks, dish antennas, capacitors, resistors, and inductors in series and parallel, RLC networks, and operational amplifier circuits. A diskette is available from the author for those who don't want to type it all in.

For more details, please check Reader Service number 211.

COMMUNICATIONS SATELLITES

The expanded second edition of *Communications Satellites* is now available from Grove Enterprises. Chapters cover spy and surveillance satellites, U.S. and Soviet manned space missions, military tactical and scientific satellites, oceanographic and weather orbiters, deep space probes, navigational and communication satellites, and private and direct broadcast satellites. Also covered are international satellites, band plans, transponder identification, and a history of satellite development.

For more information on this new edition, check Reader Service number 209.



Commodore programs from Sams.

The QSYer from Stone Mountain Engineering.

FT-757GX QSYer

Stone Mountain Engineering has announced the 757 QSYer, an accessory for the Yaesu FT-757GX which allows direct keypad entry of frequencies anywhere in the transceiver's range. The QSYer is a tiny computer terminal that interfaces directly with the 757's rear-panel data port; the QSYer draws power from the 757's accessory jack.

For more information, please check Reader Service number 208.

WORLDWIDE AIR TRAFFIC GUIDE

Cambridge Airadio has introduced a directory of HF air traffic control frequencies in the 2–22-MHz range. Cross-referenced lists include over 200 cities worldwide plus weather and airline company channels.

For more information, check Reader Service number 212.

COMMANDER II VHF AMP

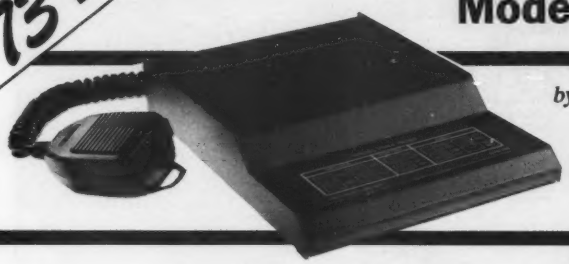
The Commander II VHF amplifier from CCIE Manufacturing uses a 3CX800A7 for 650 Watts out with only 15 Watts of drive. Stripline circuits are employed on the input for maximum efficiency. The amp comes with a 155/240-V-ac power supply and weighs only 55 pounds. Precision ball drives with a 6:1 turn ratio are used on all tuning controls.

For complete details, check Reader Service number 207.

The Commander II VHF amp.

73 Review

Digital Voice Keyer Model DVK-100



by Jeff DeTray WB8BTH

Nel-Tech Labs, Inc.
28 Devonshire Lane
Londonderry NH 03053
Price class: $349

Number 9 on your Feedback card

It's the 40th hour of the *CQ* World Wide Phone DX Contest. By the best estimate, you've already called "CQ Contest" at least 5,000 times (no kidding!). And since the log already shows 1,000 contacts, chalk up another 1,000 deliveries of the contest exchange, "five-nine, oh-five." Frankly, the ol' voice has just about had it, but there are still 8 HOURS to go! As your attention begins to wander, it wanders to the phone contester's eternal favorite fantasy: When will someone invent a device that does for phone contesting what the memory keyer does for CW? Tape loops are fine, but contesters want the real thing, a true voice keyer. Enter the Nel-Tech Labs DVK-100.

Voice Keyer Basics

The DVK-100 is a Digital Voice Keyer. It records and plays back spoken messages in much the same way that a CW memory keyer handles messages in Morse code.

Messages are recorded or changed by putting the DVK-100 into the record mode, selecting a message number, and speaking the new message into the station microphone. The keyer records the message in the speaker's own voice by digitizing and storing it in random access memory (RAM) inside the keyer. Since the stored message is a digitized representation of the speaker's own voice, it is, when played back, nearly indistinguishable from the original.

Features

With the DVK-100, you can record four different voice messages, then replay any of the four at the touch of a button. While recording, the keyer samples the speaker's voice 32,000 times per second and stores a digital representation of each sample in RAM. All those samples eat up memory in a hurry, and it takes 128K of RAM to store 32 seconds of speech, divided among four messages. Frequency response of the DVK-100 is 300 to 3,000 Hz.

The maximum length of the four messages varies. There is one 16-second message, one of eight seconds duration, and a pair of four-second shorties. These seemingly brief messages are plenty long enough for most contest purposes. For instance, four seconds is about right for recording a contest exchange, such as the aforementioned "five-nine, oh-five," a couple of times. Your callsign will probably fit twice in four seconds, producing a message that is useful when trying to break a pileup. A short, contest-style CQ fits nicely in the eight-second slot, while the 16-second message is appropriate for long CQs, the kind you might use when contest rates are low and shorter calls are ineffective.

The microphone audio passes through the DVK-100 circuitry at all times. This means you can record while transmitting, then immediately play back what you've just said. It also means that if the keyer is turned off, the mike becomes inoperative. The keyer works equally well with dynamic and electret microphones.

Built into the DVK-100 is an audio compressor designed to increase the average audio level going to the transceiver. The processor may be selected at any time for compressing "live" audio from the microphone. To use the processor for recorded messages, it must be selected at the time the message is recorded. If you record a message without compression and decide later you want compression on that message, it must be re-recorded (a 30-second job). Since recording is so easy, you'll want to experiment.

For those of you who want to play astronaut, you can select a NASA-like "beep" to be inserted at the end of each recorded message. I'm not enamored with end-of-transmission beeps, and this one, at 0.25 seconds duration, is too long anyway.

Nuts and Bolts

The DVK-100 is a compact unit housed in a metal enclosure measuring 1.65″ high, 7″ wide, and 10.6″ deep. Control of the keyer is by way of a 10-key membrane keyboard. In addition to four message keys with associated LED indicators, there are keys and LEDs for play/record, operate/program, hi/lo monitor level, plus on/off controls for the speech compressor, monitor speaker (user supplied), and end-of-transmission tone.

The rear panel features five-pin DIN sockets for connecting the DVK-100 to the station mike and transceiver. Jacks for power (10 V ac supplied by a wall-plug transformer) and for an 8-Ohm monitor speaker are also provided. Since the microphone push-to-talk (PTT) line is controlled by the DVK-100, a switch is provided to select either positive or negative PTT keying. The keyer works fine with VOX as well. Finally, Nel-Tech includes an adjustment to match the audio output level of the keyer to the requirements of your transceiver. DIN plugs are supplied to match the sockets on the keyer, but you are responsible for wiring up a short cable to connect the DVK-100 to your rig and for putting one of the DIN plugs on your microphone. The manual gives wiring instructions for most popular transceivers. Nel-Tech plans to offer cables already assembled as well.

As is so often the case with electronic products today, the manual that accompanies the DVK-100 is disappointing. For instance, it contains no discussion about such basic topics as setting the output level of the keyer or how to use the built-in audio compressor to maximum advantage in conjunction with your rig's speech processor. No schematic is supplied, either. While Nel-Tech should not be required to reveal all its secrets, buyers of accessories in this price range have every right to expect more complete documentation. Aside from the interconnection information, the manual really doesn't have much to offer.

On the Air

It works! That's the bottom line. In evaluating the DVK-100, I conducted numerous 15- and 20-meter QSOs in which I asked unsuspecting hams to help me with a "microphone test." My victims were asked to listen to three transmissions and to pick the one that sounded different from the other two. I then spoke the same short message three times, one of which was the DVK-100 doing the talking.

Approximately 25% of the listeners could detect no difference in the three transmissions. Some even apologized for their inability to say which "microphone" sounded better than the others. Of those who heard a difference, about half picked the recorded message as the one that was different. Nearly all listeners said the differences were barely discernible. The quieter the band, the more likely the recorded version would be identified.

First use of the DVK-100 during the heat of battle was in the 1986 WAE Phone Contest. I used the keyer to call CQ, break pileups, and even to give my exchange. While you won't find WB8BTH listed among the contest winners (little items like antennas and amplifiers are still necessary), the DVK-100 definitely pulled its weight. The prospect of a 48-hour phone contest no longer seems as daunting.

Conclusions

The DVK-100 represents good value. In its intended market of phone contesters, it is currently the only game in town. At present, its applications beyond the contest and DX communities are few, but you can be sure some creative hams will devise new uses for the unit. How about a poor man's voice-messaging system for repeaters? It would certainly be less expensive than existing alternatives.

For phone contesters, the DVK-100 is the solution to a long-standing problem. To arrive at the end of a long phone contest far less fatigued and with one's voice still intact is reason enough for many serious contesters to acquire the Digital Voice Keyer. The keyer works just as you would expect, given experience with CW keyers, and installation requires only wiring up a couple of connectors. I liked the DVK-100. It's a winner. Reader Service number 213.■

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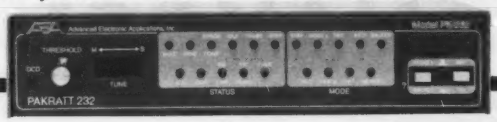
AEA PK-232 PAKRATT

by Perry Donham KW1O

Advanced Electronic Applications, Inc.
PO Box C-2160
Lynnwood WA 98036
Price class: $320



Number 10 on your Feedback card

Two years ago, when AEA came out with the PK-64 PAKRATT™ for the Commodore computer, many of us began to wonder when we'd see a PAKRATT for a generic machine. I think there was quite a bit of envy, too, as the non-C-64 owners saw how much fun it was to have a complete station controller run from the keyboard. Finally, there's some relief. AEA's PK-232 is designed to interface with any computer having an RS-232 port. And, maybe to make up for the long wait, the PK-232 is a classier unit.

The PAKRATT concept is this: AEA decided to put all of ham radio's digital operating modes into one station controller. The PK-232 will run Morse, Baudot RTTY, ASCII, AMTOR, and packet; all modes are selectable from the keyboard. All you have to do is plug a computer into the 232, run a cable over to your rig, and you're on the air!

Front Panel

The first thing that you'll notice about the PK-232 is the front panel and its twenty LEDs. The display is grouped into two sections: STATUS and MODE. Everything that you need to know about your operation is right here. MODE LEDs show not only the five basic modes, but also the "sub-mode" (FEC, ARQ, or Listen) on AMTOR. STATUS LEDs keep you in touch with what your transmitter is doing, what state the PK-232 is in, whether or not you're connected to another station, and so on. In a glance you can see exactly what's going on in the shack.

Two rigs can be attached to the PK-232; the RADIO 1/RADIO 2 switch selects which of them is active. Wiring in both a VHF and an HF transceiver gives you great flexibility of choice; the VHF and WIDESHIFT commands let you pick the appropriate tone pairs for operation on HF or VHF.

A ten-segment LED tuning display makes it very easy to net stations in on RTTY. The display is like a tiny spectrum analyzer which lets you look at the mark and space frequencies of the RTTY signal—with a little practice you can jump right on top of a station and even tell what shift is being used. For the purist, an oscilloscope output is provided on the rear panel.

Modes

The PK-232 handles just about every digital mode available to amateur radio operators. Modes are selected from the keyboard; it takes only a few keystrokes to jump from one to another. Each mode defines special keys to perform certain functions—you can turn your transmitter on and off with Control-X and Control-D, for example. The software folks at AEA spent a little time thinking about the codes to use, and as a result you'll find yourself quickly remembering which letters do what.

• **RTTY**—Typing "BA" from command mode will give you a full RTTY system. The unit will handle Baudot code at five standard speeds: 45, 50, 57, 75, and 100 baud (60, 66, 75, 100, and 132 wpm), selected by the RBAUD command. One blessing is the unshift-on-space feature which forces a switch to letters when a space is received. This comes in especially handy if you're copying things like news reports that have times and dates in them on a less-than-perfect channel. Sometimes the machine will read the shift to numbers but miss the shift back to letters. Without UOS you can end up with a few yards of nothing but numbers on your printout.

Another neat feature is the CCIT command which automatically translates characters into the International Telegraph Alphabet Number 2 used by many DX stations. You can type away and not have to worry about whether what you send as English comes out looking like Serbo-Croatian on the other end.

The PK-232 treats ASCII as a separate mode. Speeds supported are 45, 50, 57, 75, 100, 110, 150, 200, and 300 baud.

• **AMTOR**—This little-understood mode should gain some popularity with the introduction of the PK-232, since the PAKRATT makes it so easy to use. It's a bit complicated at first (there are a lot of obscure names for the different phases of operation), but the AEA manual leads you through an AMTOR QSO step by step, down to telling you which keys to press and when to press them. I think that part of the challenge of AMTOR is just figuring out how to talk with someone!

• **Morse**—The PK-232 deals very well with Morse sent from 5 to 99 wpm. The manual warns you not to expect miracles when trying to copy a poor fist, but I found the decoding algorithm to be pretty forgiving. There's a feature that sends BTs as filler characters, which I found a little annoying. I've always considered Morse keyboards to be a little silly, and this one is no different, but I must say that I was impressed by the 232's ease of use. If you're into CW keyboards, you'll definitely like this one.

• **Packet**—I have to admit that I consider the PK-232 to be a TNC that happens to have RTTY, AMTOR, and CW stuck in on the side. The 232 is a complete AX.25 level 2 TNC, and you can pick either version 1.0 or version 2.0. Up to ten multiple connections are available for those who tend to be slightly schizophrenic.

One of the best features is a complete set of MONITOR commands which let you keep track of who's on the channel, what path they're using, and what time they're on (using the built-in clock). You can also filter out stations that you'd rather not see on the screen, such as crazies who beacon every 10 seconds or BBSs spewing out last week's propagation bulletin. Speaking of beacons, the PK-232 will let you know if it thinks you're beaconing too often! (I think that it should display the "beaconing too often" message any time a beacon is turned on.)

You can switch very quickly from VHF to HF packet just by hitting the RADIO 1/RADIO 2 button and selecting the appropriate tone pair; it takes about 10 seconds.

Overall

I was impressed with the PK-232. As I mentioned, I would buy it primarily as a TNC and justify the added expense by using the other modes now and then. You could, I suppose, buy it as a RTTY TU and use it on packet and CW now and then. The big selling point is that you get all five modes right at your fingertips out of one small box.

The unit is built with the usual AEA attention to quality and I expect it to run practically forever. I didn't have any trouble at all with interference to or from the computer.

If you have any interest at all in using digital modes on ham radio, I would strongly recommend buying the PK-232. Reader Service number 214.■

Heathkit HS-148 Compact PC

by Perry Donham KW1O

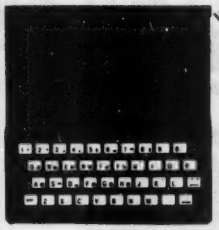
Heath Company
Dept. 150-815
Benton Harbor MI 49022
Price class: $900

Number 11 on your Feedback card

You can't go to a hamfest anymore without seeing at least two companies selling IBM PC-compatibles. This year's Dayton Hamvention had six! Hams are buying up these units faster than surplus HTs; I have the feeling that the days of the VIC-20 and C-64 are numbered.

The reason that these units are selling in such volume is the price/performance ratio. As the price of clones falls, it gets to a point where it's just silly not to buy one. Why spend several hundred dollars on a C-64 with a monitor and drives when for a few hundred more you can pick up a computer that's IBM-compatible and comes with 360K drives and 256K of RAM?

The real question, then, is where to buy your



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See September 1984 issue of 73 for TIMEX/RTTY article

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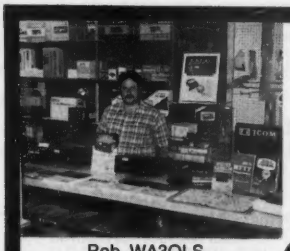

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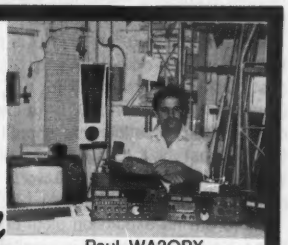

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computer. I spent several months wandering the hamfests, observing seedy-looking salesman handing out mimeographed information sheets. The prices were fine, but somehow I didn't believe that I would get much support if I ever needed help. Then one day I wandered into the Heath booth.

Heath's HS-148

Heathkit sells several PC-compatibles. I chose one on the low end of the scale since I really didn't need coprocessors, multitasking, and networking. The HS-148 kit seemed to perfectly fill my requirements for a low-cost, multipurpose machine that would let me do word processing, programming (in languages other than Basic), and would have the ability to control the shack.

The basic HS-148 comes standard with 256K of RAM (expandable to 640K), one 360K half-height disk drive, a monochrome monitor, and the MS-DOS operating system. The keyboard is full-size (including 10 function keys) and has an excellent feel. Both composite monochrome and RGB video are supported, and one parallel and one serial port are brought to the back panel.

The processor is an 8088 16-bit CPU running at 4.7 or 8 MHz. A front-panel switch lets you select the clock speed; so far I've toggled to 4.7 MHz only once, to see how much slower things ran (noticeably slower). There's a spot for an 8087 numeric coprocessor, and Heath offers the chip as an option for $285. I can't think of many applications that need the extra number-crunching capability, especially in a home environment.

All of the cabling for drive B is in the kit. Heath's second drive retails for $200; I suggest buying one mail-order for half the price (Jameco has one for $109). As long as the drive is PC-compatible you should have no trouble—just bolt it down and plug it in. Wherever you get it, it's well worth the extra price for the second drive.

There are no expansion slots on this machine. You've got the built-in parallel and serial ports to work with, but if you need more than that you'll have to buy the ZA-141 Daughter Board for $99. This unit is installed above the I/O board and allows the use of one additional plug-in board (a standard PC has seven expansion slots). I have a couple of applications that require joysticks, so I'll probably end up using the ZA-141 in conjunction with the PCS-110 Game Port ($69.95).

Construction

The computer came in two giant boxes. It took about ten minutes to pull everything out, and only another hour to completely assemble the system. There is no soldering going on here—you just bolt things down and plug them in. I knew it would go quickly, but I was still surprised when I looked at my watch! The construction manual is very thin; about half of it deals with installing disk drives.

The computer comes in two parts, a CPU section and an input/output section, which are connected to each other with a 60-conductor cable. Sockets for two additional banks of RAM are provided on the CPU board. Expanding memory to 640K is extremely simple—you just plug the memory in and set a few DIP switches to tell the processor how much RAM to expect. It takes about three minutes. I would suggest not buying extra memory from Heath. I hate to keep knocking Heath add-ons, but they tend to be a bit pricey (their 256K RAM sets are $80, while you can pick up the same parts at Jameco for about $30). If you're not comfortable mucking around inside a computer, spend the extra bucks and get Heath's excellent instructions and support.

Operation

Once things were all together, I raced through the diagnostics and grabbed Micro-Soft's Flight Simulator off the shelf. I figured that if the HS-148 could run this, it could run anything! I managed to fly right into the Statue of Liberty with no problem.Some of the packages I've run are WordStar, SideKick, CrossTalk XVI, and the Perfect series of integrated software, all with no hitches.

I'm Happy

I've been extremely pleased with the HS-148 computer. Assembly was a snap (literally!), and the thing has run flawlessly from the first time I powered it up. It's faster than my IBM PC, and smaller and lighter, too. I like the keyboard a lot (better, I think, than the IBM's and infinitely better than Leading Edge's), and the display is sharp. It runs every scrap of software I've fed it without blinking.

The documentation is about as heavy as the computer and *very* complete. You also get a set of docs for MS-DOS. There's more stuff in these books than you'll ever want to know.

Is it worth the extra hundred or so dollars to buy a clone from Heath? I think it is. First, I trust Heath's quality control. I've built several Heath kits and have had no trouble whatsoever with them. Second, I know that if something goes wrong, I can call Heath on the phone and they'll help me. They have people whose job it is to do that. Finally, I can join Heath's User's Group and get access to cheap software!

Heath's Christmas catalog has the HS-148 and all of the accessories in it; you can get a copy by writing to Heath Company, Dept. 150-815, Benton Harbor MI 49022, or check Reader Service number 215.■

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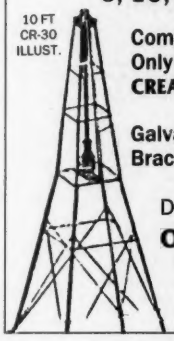

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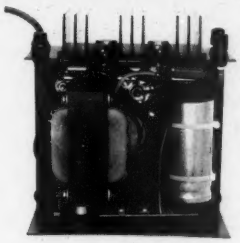

INSIDE VIEW – RS-12A

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MODEL RS-50A

MODEL RS-50M

MODEL VS-50M

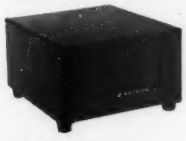
RM-A Series

MODEL RM-35A

19" X 5¼ RACK MOUNT POWER SUPPLIES

Model	Continuous Duty (AMPS)	ICS* (AMPS)	Size (IN) HXWXD	Shipping Wt. (lbs.)
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
• SEPARATE VOLT & AMP METERS				
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50

RS-A SERIES



MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt (lbs)
RS-4A	3	4	3¾ x 6½ x 9	5
RS-7A	5	7	3¾ x 6½ x 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 x 7½ x 10¾	11
RS-12A	9	12	4½ x 8 x 9	13
RS-20A	16	20	5 x 9 x 10½	18
RS-35A	25	35	5 x 11 x 11	27
RS-50A	37	50	6 x 13¾ x 11	46

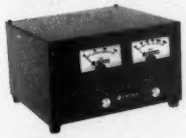
RS-M SERIES

MODEL RS-35M

• Switchable volt and Amp meter

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt (lbs)
RS-12M	9	12	4½ x 8 x 9	13
RS-20M	16	20	5 x 9 x 10½	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13¾ x 11	46

VS-M SERIES



MODEL VS-20M

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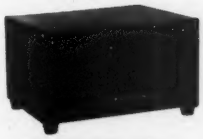
- Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H x W x D	Shipping Wt (lbs)
VS-20M	16	9	4	20	5 x 9 x 10½	20
VS-35M	25	15	7	35	5 x 11 x 11	29
VS-50M	37	22	10	50	6 x 13¾ x 11	46

RS-S SERIES



MODEL RS-12S

• Built in speaker

MODEL	Continous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt (lbs)
RS-7S	5	7	4 x 7½ x 10¾	10
RS-10S	7.5	10	4 x 7½ x 10¾	12
RS-10L(For LTR)	7.5	10	4 × 9 × 13	13
RS-12S	9	12	4½ x 8 x 9	13
RS-20S	16	20	5 x 9 x 10½	18

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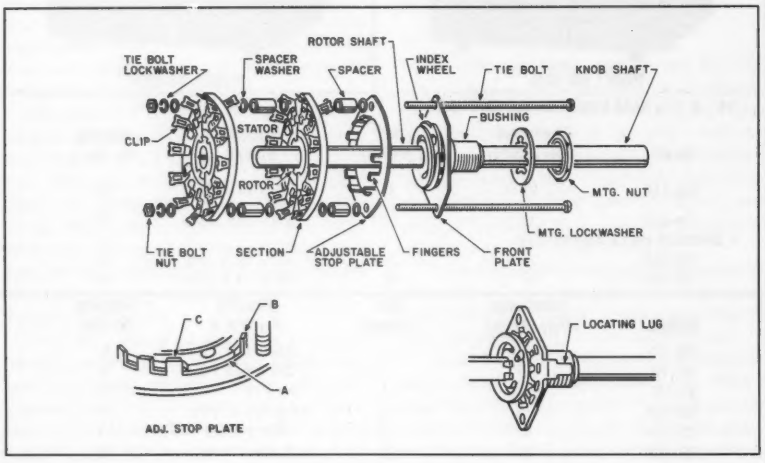

Fig. 1. Exploded view of the Centralab PA-1000 and PA-2000 rotary switch.

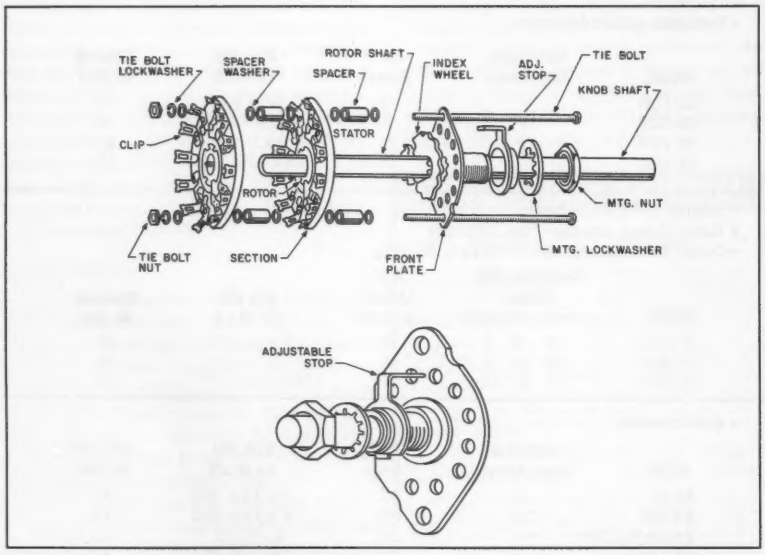

Fig. 2. Exploded view of the 1400- and 2500-series standard rotary switch.

With the introduction of new amateur bands in the HF spectrum, many transmitters, vfo's, and receivers have been rendered obsolete or at least out of place. However, much can be done if you're willing to adapt existing equipment to the new bands. It sure would be nice to expand the range of a vfo with an extra tuned circuit or add a new band to a ham-band-only receiver.

Older equipment usually has multi-position rotary switches which can be rebuilt to make

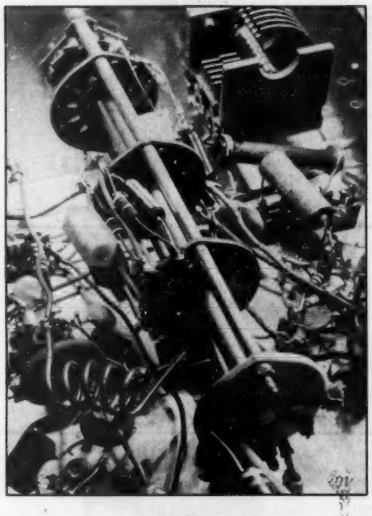

Photo A. Typical medium-power transmitter bandswitch (Allied T-150A) with four gangs or index assemblies (or wafers). The closest gang in the photo is made out of porcelain for the final amplifier. You will need at least a 3/16" screw here. The other thinner phenolic wafers behind this will accept a 1/8" screw. Before obtaining the small 0-80 hardware, check for proper minimum screw length in your own equipment. In addition, perhaps you can use the larger 1-72 or even 2-56 hardware if the wafers and corresponding holes are bigger. Also, the still smaller 00-90 and 000-120 are available. Obtain a catalog!

room for additional LC circuitry. For instance, an 80- through 6-meter medium-power transmitter uses six band positions, but has 11 potential positions in the bandswitch. This article involves the use of these extra positions.

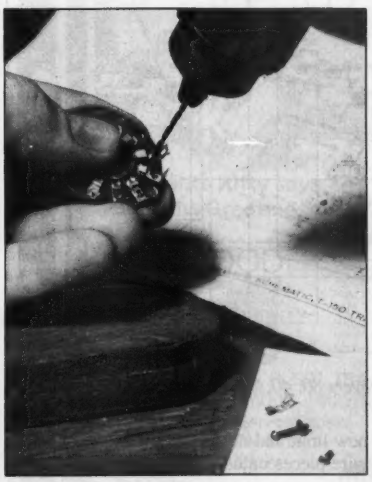

Photo B. The drilling out of slide-contact teeth. Please use a heavy glove when doing this and don't drill toward yourself. Lean the part lightly against a block of wood while drilling. If the wafer jams, let it slip from your heavily gloved fingers and unjam it manually. Believe it or not, I broke a small hobby drill trying to do this. Try not to break a wafer!

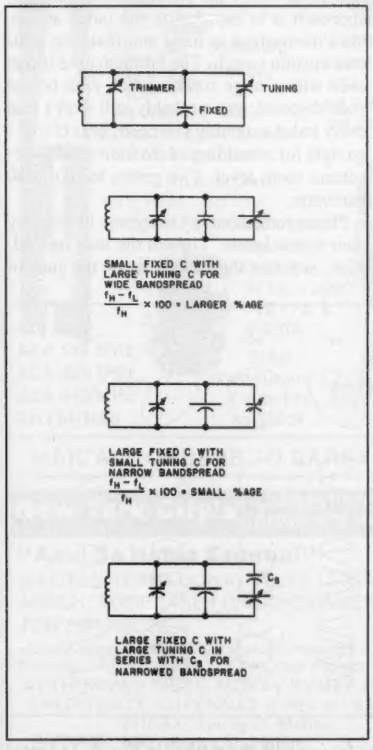
TRIMMER
TUNING
FIXED
SMALL FIXED C WITH LARGE TUNING C FOR WIDE BANDSPREAD
$\frac{f_H - f_L}{f_H}$ × 100 = LARGER %AGE
LARGE FIXED C WITH SMALL TUNING C FOR NARROW BANDSPREAD
$\frac{f_H - f_L}{f_H}$ × 100 = SMALL %AGE
C_s
LARGE FIXED C WITH LARGE TUNING C IN SERIES WITH C_s FOR NARROWED BANDSPREAD

Fig. 3. Methods of varying band-spread.

The rebuilding of the bandswitch by the addition and movement of contact teeth can start with the removal of parts from a junkbox rotary switch of the same manufacturer and type as the bandswitch. Carefully match the make and physical size—bring the junkbox switch to actually touch and match the bandswitch if possible. There are very small and subtle differences among rotary switches, so you must make sure that your switches are mechanically compatible. When you're sure, use a small drill to remove the miniature rivet so you can salvage the slide-contact teeth (see Photo B). These teeth are then fitted into the unused holes of the index assemblies (or "wafers") on the bandswitch being converted.

Additionally, you probably need to shift some teeth on the bandswitch (see Photo C) by drilling out inappropriate tooth fasteners and shifting around the loose teeth to appropriate locations. (Do I sound like a dentist?) To position the drill at a good angle, the bandswitching assembly will have to be loosened from its position and, in case of multiple sections, removed. See if you can get away with not having to remove the whole

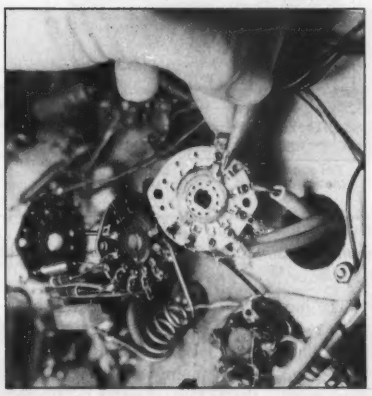

Photo C. Bandswitching wafer from an Allied T-150A transmitter (80 through 6 meters) with added band position. Long-toothed contact at 7 o'clock had just been shifted one stop clockwise and resulting space replaced with a short-toothed contact. Notice the two small screw heads holding their respective contacts. Also notice how this index assembly and the ones behind it are hanging on by their leads—switching shaft and pillars are removed. Back in it all goes.

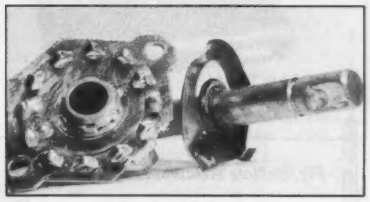

Photo D. Custom stop plate on T-150A bandswitch (originally made for six positions) showing former stop at 8 o'clock after having been banged in and flattened with a nail-set tool. The other stop at 2 o'clock was left alone (look carefully). "Index wheel" sits on shaft and is disassembled from the stop plate in this photo. Single tab on index wheel hits stop in assembled position. Note that this former 6-position stop is now an 11-position stop, as the index wheel now can travel 330 degrees instead of 180 degrees. A new stop has yet to be fashioned to limit travel to 210, 240, or 270 degrees depending on whether 1, 2, or 3 new WARC bands are to be designed into the transmitter (or receiver).

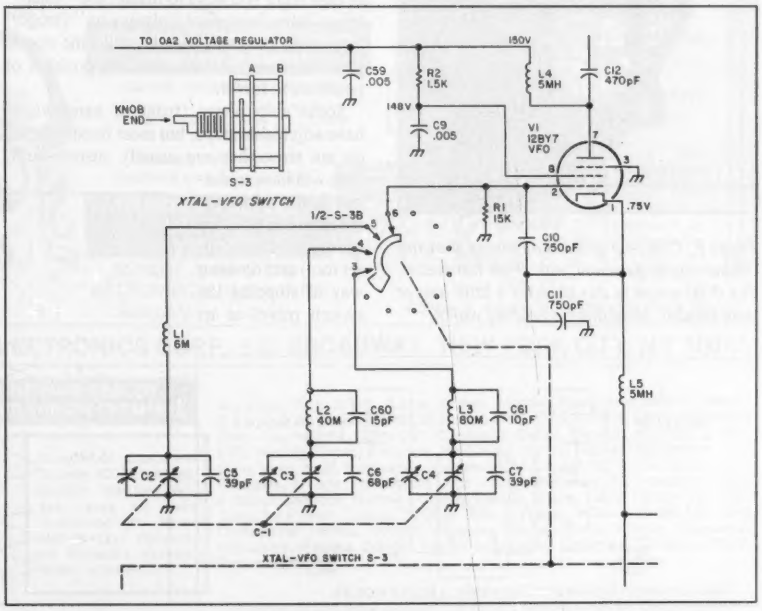

Fig. 4. The vfo circuit of the Allied T-150A transmitter. The 80m tank oscillates on 160m, and the 40m tank is on 80m. The 6m tank runs from 8.333 to 9 MHz.

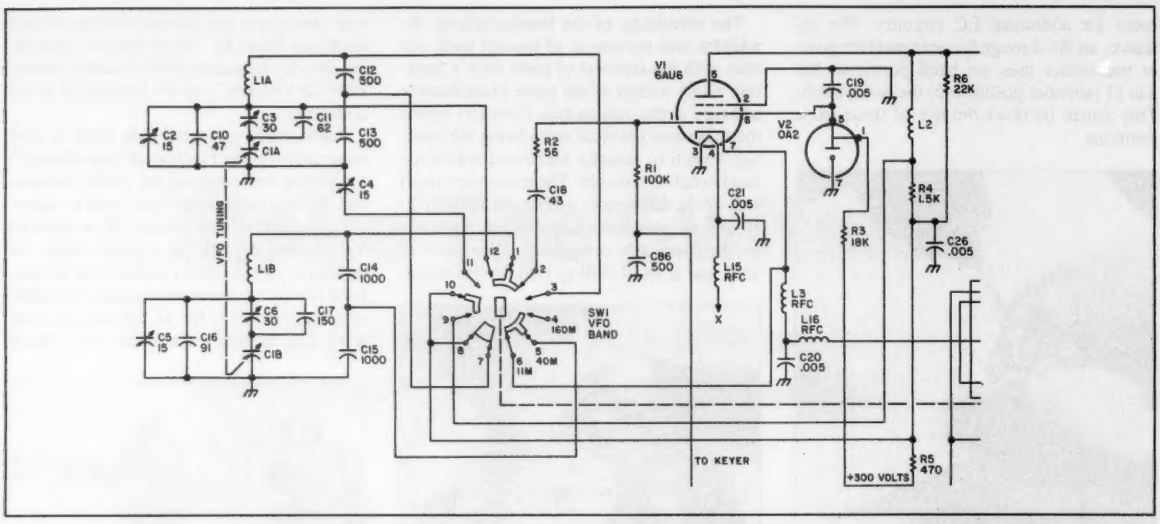

Fig. 5. Note the number of capacitors used in the Johnson Ranger's tuned circuits. The unit covers 80, 40, 20, 15, 11, and 10 meters.

bandswitch. But if you can't, don't be afraid to perform major surgery.

Isolating the bandswitch from the unit and working on it separately is the best approach (see Photo D). The good thing about a bandswitch is that everything comes apart and goes together again—it is mechanical. Don't lose parts, remember their order of removal, and don't use too much force.

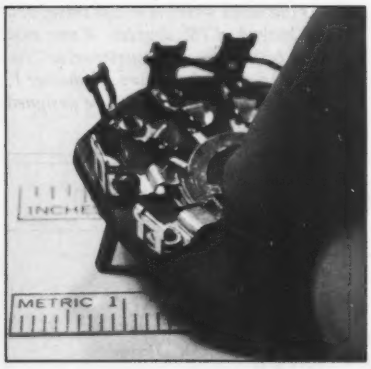

Photo E. Close-up of index assembly showing contact tooth fastened with 0-80 hardware. The 0-80 screw in this photo is a little longer than needed. Note fingers holding wafer.

The individual index assemblies will have to be twisted out of position by removing the two pillars—one on each side. Remove the two long screws running the length of the bandswitch—the tie bolts. *Loosen the tie-bolt nuts, not the screw heads!* Pull out the bolts, and the pillars will fall from position. The wafer indices now will be hanging on discrete parts, or vice versa. Now you are better able to position the wafers for drillouts and modification.

Hardware of 0-80 size (see Photo E) fits the holes and contact teeth of most bandswitching wafers in receiving and low-to-medium-power transmitter circuits of slightly earlier vintage. Make sure you determine the types of new teeth you need to install: the "make" (physically shorter) or "always on" (longer) type. Also, you will have to adjust the stop to give the rotary switch an extra position or positions to travel.

Some stop plates (front of bandswitch) have adjustable stops, but most bandswitches do not since they are usually custom-built. You will have to flatten in the appropriate stamped-out stop (perhaps with a nail-set tool) and devise a way of stopping the switch travel at its new limit and not beyond: I soldered heavy wire pieces onto the stop plate. Other ways are banging in your own stop or adding a small screw—or you can leave it alone (not recommended). Save all the parts carefully and reassemble in the proper order! Also, relabel the front panel as needed.

You can order separate rotary-switch index assemblies through manufacturers' catalogs, choosing your required switching sections, shaft parts, and shaft flat angles (angles at which the switch stops). Another approach is to cannibalize the index assemblies themselves as units and make up your own custom switch. The problem here is that even with a large rotary-switch junk box at your disposal, you probably still won't find every index assembly you need. This is why I go right for rebuilding on the individual slide-contact tooth level. I've gotten to like 0-80 hardware.

Please remember not to tighten tie bolts by their screw heads. Tighten the nuts instead. Also, separate the metal nuts on the ends of

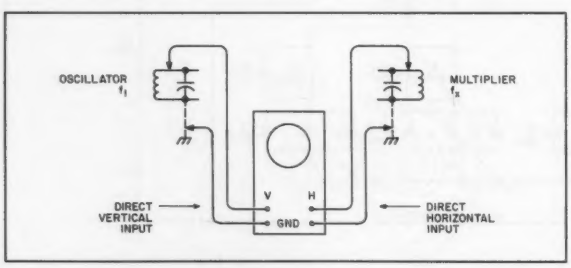

Fig. 6. Use an oscilloscope to determine the multiplication factor of a multiplying stage.

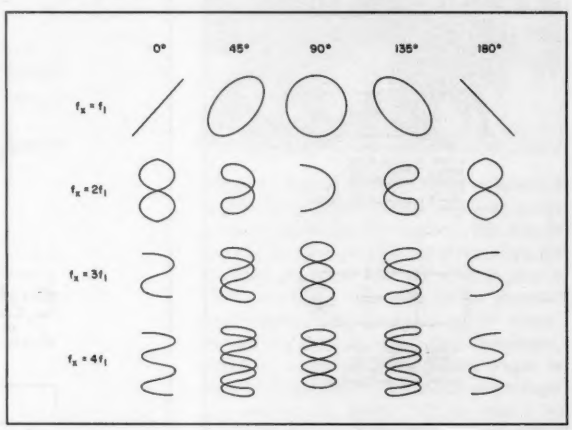

Fig. 7. Lissajous patterns for use with the method in Fig. 6. (Adapted from the Practical Oscilloscope Handbook.*)*

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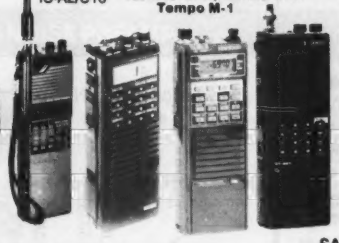
Yaesu FTC-2203, FT-4703
Icom IC-M12 (Marine) M700
Tempo M-1



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the tie bolts with the phenolic washers and then the split rings before tightening.

Once you have planned your work and installed the new physical switch positions, you must add appropriate LC circuits. Consult the *Handbook* and pull out the grid-dip meter. A few tips will save you time. Say you have an old transmitter that you're converting: Try getting to a flea market to find the same transmitter in fair condition at a good price. Remove whatever coils, brackets, etc. that are needed and add or subtract turns to salvaged coils that are peculiar to the equipment. You'll have your coils, trimmers, lots of spare parts, and less available storage area!

Old TVs and radios have nice coils and cores, a few of which may suit your need with some modification. Also, you can wind a fixed coil using a megohm-size resistor as a coil form. Note that some buffer-circuit coils have shunt resistors anyway and range in value from around 5k to 10k. Coils might even be customized using old rf chokes or coils from which the original winding was removed. An unknown here would be core permeability, so you'd need to experiment with winding your coil. Another approach is to sacrifice the LC circuits of an original band for a new band—winding or unwinding wire on the coil forms and juggling capacitors. Here, you will not need to rebuild the bandswitch mechanically.

The methods suggested here are cut-and-dry. Using some observation, you can look at the 40-meter and 20-meter coils to get an idea of what the in-between 30-meter coils should be like. (Do the same for the 17- and 12-meter bands.) Again, use the grid-dip meter if available, space trimmers and cores at halfway points, and interpolate fixed capacitor values using the NPO types.

There is a bit of a problem with the new ham bands. In addition to their inconvenient locations—on odd frequencies—they are very narrow, making band-spreading a problem. A glance at Table 1 shows bandwidths for these new WARC bands of only 0.4% to 0.55% when compared with the spectrum space below and including each one, whereas the traditional bands vary from 2% (15m) to 12.5% (80m). This means a careful selection of LC components is required to obtain comfortable band-spreading.

This article is a guide, and the table I drew up is to help you with the relative numbers for converting LC circuits in vfo's, receiver rf amplifiers, and antenna circuits. Some equipment, such as a general-coverage receiver, defies conversion. Other equipment, like the Viking I and II transmitters, containing variable inductors in the final, might possibly operate on the new bands with little or no conversion if they had a converted vfo or odd-frequency crystals. (It would be good to hear from those who already have some experience in this area.)

In the case of frequency multiplication, there is the possibility that the doubler, tripler, or quadrupler may be tuned to the wrong frequency! Good output on the wrong

Bands in Meters	f_L Lower Limit MHz	Mean f MHz	f_H Upper Limit MHz	Width in MHz	% Spectrum from f_o	% Spectrum Below 30 MHz	$f_L/2$	$f_H/2$	$f_L/3$	$f_H/3$	$f_L/4$	$f_H/4$	$f_L/6$	$f_H/6$	$f_L/8$	$f_H/8$	$f_L/12$	$f_H/12$	$f_L/16$	$f_H/16$	$f_L/18$	$f_H/18$
160	1.8	1.9	2.0	0.2	10	0.667																
80	3.5	3.75	4.0	0.5	12.5	1.667	1.75	2.0														
40	7.0	7.15	7.3	0.3	4.10958	1	3.5	3.65	2.333	2.4333	1.75	1.825										
30	10.1	10.125	10.15	0.05	0.49261	0.1667	5.05	5.075	3.3667	3.3833	2.525	2.5375										
(New)		λ=29.63m																				
20	14.0	14.175	14.35	0.35	2.43902	1.1667	7.0	7.175	4.667	4.7833	3.5	3.5875										
17	18.068	18.118	18.168	0.1	0.55041	0.333	9.034	9.084	6.02267	6.056	4.517	4.542	3.01133	3.028								
(New)		λ=16.56m																				
15	21.0	21.225	21.45	0.45	2.0979	1.5	10.5	10.725	7.0	7.15	5.25	5.3625	3.5	3.575								
12	24.89	24.94	24.99	0.1	0.40016	0.333	12.445	12.495	8.29667	8.333	6.2225	6.2475	4.14833	4.165	3.11125	3.12375						
(New)		λ=12.03m																				
CB	26.965	–	27.405	0.44	1.60554	(1.4667)																
Old 11	26.9	–	27.36	0.46	–	–	13.45	13.68	–	–	6.725	6.84	Old 11-meter vfo's									
10	28.0	28.85	29.7	1.7	5.7239	5.667	14.0	14.85	9.333	9.9	7.0	7.425	4.667	4.95	3.5	3.7125						
6	50.0	52.0	54.0	4	7.4074	–	25.0	27.0	16.667	18.0	12.5	13.5	8.333	9.0	6.25	6.75	4.1667	4.5				
2	144	146	148	4	2.7027	–	72	74	48	49.333	36	37	24	24.667	18	18.5	12	12.333	9.0	9.25	8.0	8.222
	Classical amateur bands as % of spectrum below 30 MHz					11.667																
	New and classical amateur bands as % of spectrum below 30 MHz					12.50																

Table 1. For vfo conversions. Before modifying, double-check any numbers for errors! 6 and 2 meters are covered here because these vfo bands fall in the HF spectrum. 11 meters (now CB, of course) was included since some of the early vfo's and transmitters contain the old 11-meter ham band (Johnson Ranger and others). Also, you may find a CB vfo. These should be easy to convert to 12 meters. Note that a 2-meter vfo at 9 to 9.25 MHz (f/16) will cover 17 meters on f/2. Also, a 6-meter vfo at 8.333 to 9 MHz (f/6) can be detuned on the low end to cover 12 meters (f/3). However, you may consider the band-spreading on the first to be inadequate without further conversion. Some combined 6- and 2-meter vfo's have "continuous" band-spread from 8 to 9 MHz. The f/18 of 2 meters is from 8 to 8.222 MHz, but the dial *will go to 8.333 as the upstairs 6 meters extends from 8.333 to 9 MHz (f/6) with the same variable capacitor. This is good for 12 meters with reasonable band-spreading. 30 meters is more difficult. If you can get an 80-meter vfo on "90" meters, then you have f/3. Band-spreading is still a problem without more work. "Percent spectrum from f_o" column: $(f_H - f_L)/f_H \times 100$ = % spectrum from f_o (0 Hz), and was computed for band-spreading purposes.*

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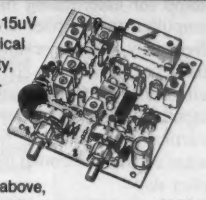

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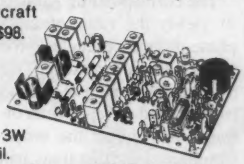

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	28-30	50-52
	27-27.4	144-144.4
	28-30	220-222*
	50-54	220-224
	144-146	50-52
	144-146	28-30
For UHF, Model XV4 Kit $79 Wired $139	28-30	432-434
	28-30	435-437
	61.25	439.25
	144-148	432-436*

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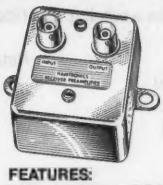

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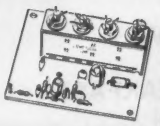

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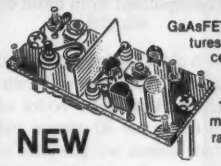

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harmonic can be confusing. Fig. 6 shows a setup for determining the frequency of an amplifier or multiplier as compared with the frequency of its preceding stage. A broadband oscilloscope is connected to the tank circuits of the stages under test using direct input with the shortest possible leads—the vertical input coming from the oscillator stage and the horizontal input from the multiplier stage.

The corresponding Lissajous pattern (Fig. 7) yields the ratio of multiplication (and phase-difference angles). Switch off the internal sweep on the scope, put the sync selector switch on external, and set both gain controls to zero. Then switch on the transmitter stages and adjust the scope gain controls. Compare your Lissajous pattern for the answer as you tune the buffer/multiplier. If you obtain other unwanted harmonics, avoid those control settings in the future—or better yet, try to design them out. As you may be putting in your own multiplier circuits, try to eliminate unwanted multiplication by adjusting LC values. Again, coil sizes and capacitor values can be interpolated from those on adjacent bands.

There is still much older equipment around with good solid names like Johnson, Heathkit, National, Hammarlund, etc. A lot of the tube stuff will never see 30 meters and the other new bands unless we get used to the idea of conversions. Good luck with all attempts! ■

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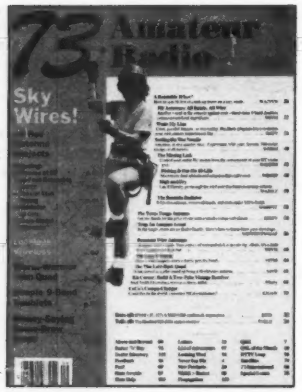

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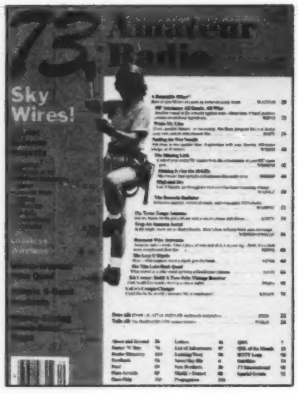

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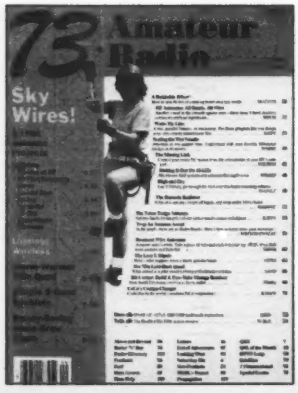

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Current technology offers seemingly limitless equipment opportunities for the CW operator. We are all familiar with filters, memory keyers, keyboards, and visual display readers. *73* has provided us with construction articles for most of these accessories.

Many people feel that keyers are responsible for improving the average fist heard in the CW subbands. Furthermore, the memory feature is indispensible to the contester. It would be nearly impossible to find a high-scoring contest station that doesn't use a memory keyer. The memory advantage is that the operator is given a few free moments for logging, duplicate checking, or other things. Most people find it's difficult to write left-handed while simultaneously sending CW with the right hand!

This is well and good, but it doesn't do much for the phone contesters or other hams who like SSB. They might feel somewhat left out with respect to operating aids. Consequently, I would like to offer my contribution, however small, in the form of a closed-loop cassette tape for CQing or other purposes. Here, the primary advantage is being able to speak after 24, 48, or ?? hours of phone operation.

This is not an original idea, but rather an improvement that provides a way of automatically synchronizing several messages and turning the recorder off after each individual message. Naturally, the recorder could be manually timed, but that requires paying enough attention to remember to release the switch before the beginning of the next message. Anyway, why should the operator need to perform such a menial chore when a much lazier, that is, more time-effective method is available?

I have found that a 20-second closed-loop tape (Radio Shack 43-401) allows the recording of three CQs and still provides time for the recorder to come up to speed. This tape-loop controller is a fairly straightforward circuit to build and does not require any test equipment to calibrate.

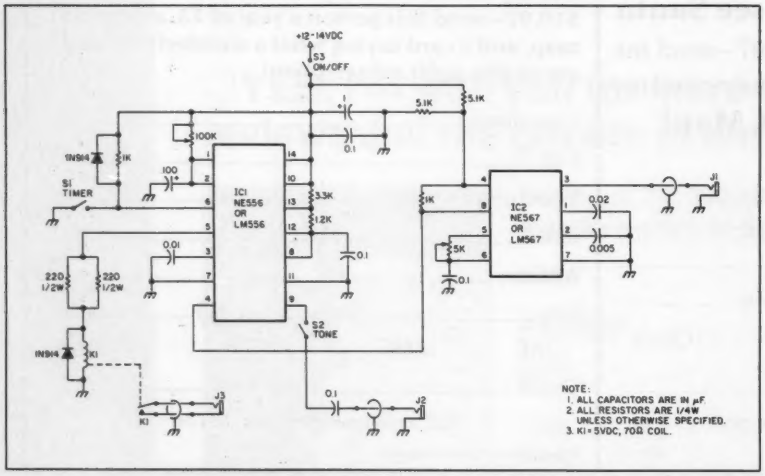

Fig. 1. Schematic diagram of the Accu-VOX controller.

The IC that controls the recorder is an NE556, which consists of two NE555 chips in one package. In our case, the 556 IC is wired both as a timer and an oscillator. A glance at the schematic (Fig. 1) indicates that the circuit also involves a tone decoder. Before you get into the entire circuit, it might be helpful to become familiar with the basic 555 IC itself. If this is old hat for you, just jump ahead to the next section.

The NE555 can be wired to perform either of two functions: a timer (one-shot device) or an oscillator (astable vibrator). The timer produces a constant output voltage for a time approximately equal to the time constant of an external resistor-capacitor combination using the formula: time (seconds) = 1.1 x RC.

As shown in Fig. 2, this device can be wired to be in the normally on mode rather than being normally off.

The timer is started by applying a negative voltage pulse at pin 2, which is the trigger pin of this IC. Additional triggering pulses applied before the device times out have no

Pin No.	Purpose
1 (7)	Discharge
2 (6)	Threshold
3 (5)	Control voltage
4 (4)	Reset
5 (3)	Output
6 (2)	Trigger
7 (1)	Ground
8 (2)	Trigger
9 (3)	Output
10 (4)	Reset
11 (5)	Control voltage
12 (6)	Threshold
13 (7)	Discharge
14 (8)	4.5–18 V dc

Table 1. NE556 pinout table. Numbers in parentheses are the corresponding NE555 pins.

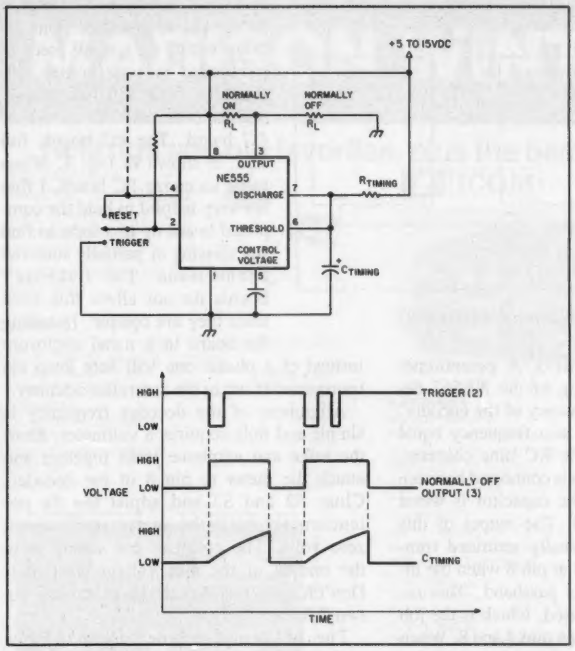

Fig. 2. Wiring and waveform diagrams for an NE555 in timer (monostable) mode. Output pulse (seconds) = R_{timing} x C_{timing}. Note that output duration is unaffected by multiple triggering pulses.

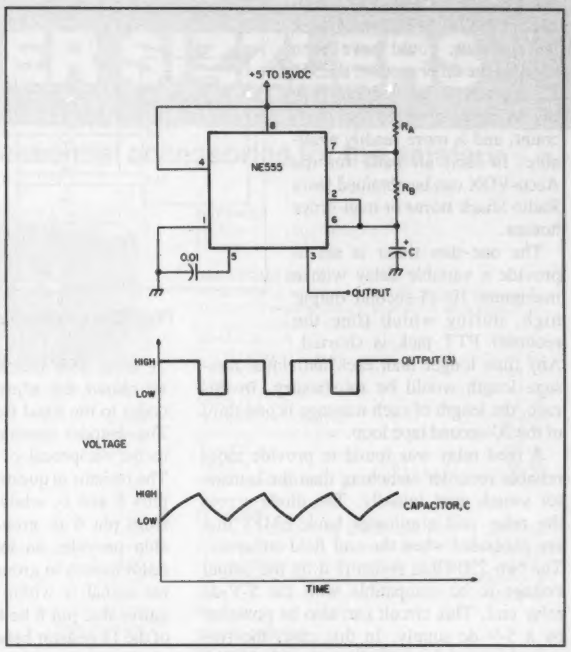

Fig. 3. Wiring and waveforms for astable (oscillating) mode of operation. Output high (seconds) ≈ 0.7(R_A + R_B)C. Output low (seconds) ≈ 0.7(R_B)C. Frequency = 1.44/(R_A + R_B)C.

effect. However, a negative pulse applied to pin 4 during this time will reset the output to its normal (off) state. When the reset feature is not used, it should be connected to the supply voltage to prevent false triggering.

The small capacitor at pin 5 provides an internal reference voltage. The chip is powered by a 5–15-V-dc supply connected between pin 1 (ground) and pin 8. Bypassing the voltage supply at pin 8 to ground with a 1.0-uF and a 0.1-uF capacitor will help keep voltage transients out of this linear IC. The output voltage appears at pin 3 and is about 0.5 volts lower than the supply voltage. This output can source or sink up to 200 mA. The output can be set from less than a second to 15 minutes by proper selection of the resistor and capacitor connected to pins 6 and 7. Substitution of a potentiometer for the fixed resistor results in a timer with a variable latch time.

The wiring diagram in Fig. 3 converts the timer into a square-wave oscillator. This circuit is also called a free-running multivibrator by people who don't like complicated names like oscillator. The frequency of this oscillator is determined according to the following equation: f = 1.44/(R_A + 2R_B)C.

Fig. 3 also shows the waveforms that are present at the more important points of the circuit. Armed with this information, it is a simple matter to make a 10-minute ID timer, code-practice oscillator, or whatever.

Accu-VOX Circuit

A basic timer will not work for the Accu-VOX controller since each of the several messages cannot be made to be the same precise length. The timer would soon become out of synchronization with the messages and havoc would be upon us. The solution is to encode a tone on the tape after each message using the oscillator section of the NE556. Table 1 shows the NE556 pins and the corresponding ones for the NE555.

Another IC, an NE567, is used to decode the tone burst and reset the timer, thus turning

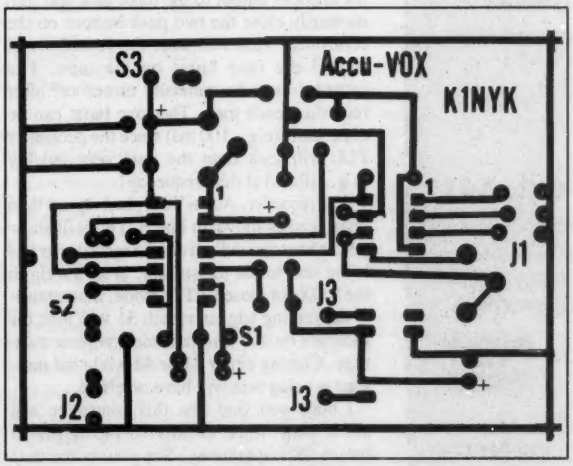

Fig. 4. PC board, foil side.

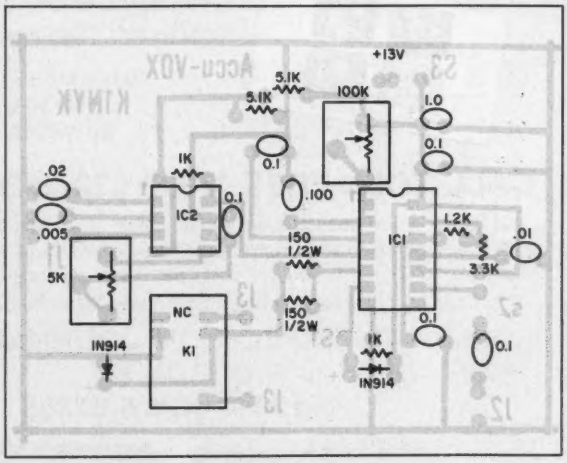

Fig. 5. Parts placement.

off the tape. While TTL chips such as the 74LS121, which draw less current, could have been used for the timer section, the 556 IC requires a less critical supply voltage, reduces the parts count, and is more readily available. In fact, all parts for the Accu-VOX can be obtained from Radio Shack stores or mail-order houses.

The one-shot timer is set to provide a variable delay with a maximum 10–11-second output high, during which time the recorder PTT jack is shorted. Any time longer than each individual message length would be satisfactory. In this case, the length of each message is one-third of the 20-second tape loop.

A reed relay was found to provide more reliable recorder switching than the transistor switch used initially. The diode across the relay coil eliminates back EMFs that are generated when the coil field collapses. The two 220-Ohm resistors drop the output voltage to be compatible with the 5-V-dc relay coil. This circuit can also be powered by a 5-V-dc supply. In this case, the two resistors in series with the relay should be eliminated along with the two 5.1k resistors attached to IC2.

An audio tone of about 2600 Hz was chosen for the encoder so that it would be outside the typical 2200–2400-Hz passband of most SSB transmitters. A potentiometer allows the adjusting of the NE567 decoder to the fixed frequency of the encoder. The decoder operates at a frequency equal to the reciprocal of the RC time constant. The resistor in question is connected between pins 5 and 6, while the capacitor is wired from pin 6 to ground. The output of this chip provides an internally saturated transistor switch to ground at pin 8 when the input signal is within its passband. This requires that pin 8 be biased, which is the job of the 1k resistor between pins 4 and 8. When pin 8 goes low, the resulting negative pulse resets the 556 timer and the recorder is turned off by removing the short on the recorder PTT jack.

There is nothing critical about building this device, although the bypass capacitors should be located as close to the integrated circuits as possible. Point-to-point wiring on a small piece of perfboard is satisfactory, although a better quality product will be obtained with an etched PC board. The PC board, foil side, is shown in Fig. 4. When using an epoxy PC board, I find it's very helpful to hold the completed board up to a light to find any missing or partially soldered connections. The Bakelite™ boards do not allow this trick since they are opaque. Installing the board in a metal enclosure instead of a plastic one will help keep the transmitted rf out of the controller circuitry.

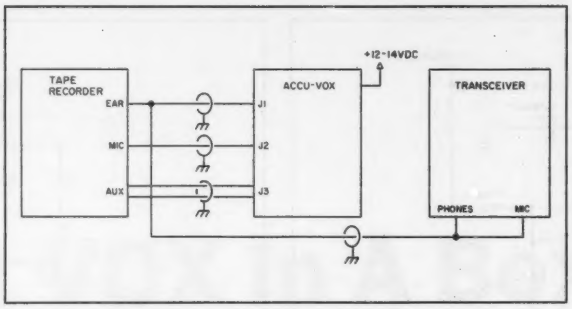

Fig. 6 Interconnection diagram for Accu-VOX.

Alignment of the decoder frequency is simple and only requires a voltmeter. Short the mike and earphone jacks together and attach the meter to pin 8 of the decoder. Close S2 and S3 and adjust the 5k potentiometer until the meter reads about zero volts. The optimum pot setting is in the middle of the null voltage passband. Don't forget to remove the short between the two jacks.

The following recorder characteristics are necessary: ac operation, rapid deceleration, and remote mike and PTT jacks. Ac operation is necessary because the current drain is too high for battery operation. I have encountered no rf problems with the ac supply. When such problems are encountered, they can usually be eliminated by winding a few turns of the ac cord around a toroidal core. A rapid motor deceleration is necessary since the recorder motor must stop, rather than slow down, when the PTT switch is opened. This eliminates sequencing problems as well as sending highly distorted audio to the transmitter. The PTT jack is used as explained above. The remote mike is required since internal condenser mikes can pick up too much of the motor noise and also make decoding the tone burst more difficult. Fortunately, most recorders comply with these simple requirements.

After each message is recorded, connect the encoder output to the mike jack and momentarily close the two push-buttons on the controller. This will start the recorder and record the tone burst on the tape. The recorder must be manually turned off after recording each tone. The tone burst can be quite short (e.g., 100 ms) since the decoder's PLL will lock onto the tone very quickly (e.g., 10 ms) at this frequency.

The recorder, Accu-VOX, and rig are then interfaced as shown in Fig. 6. This will allow you to hear the audio from the recorder as it is being sent to the transmitter. With the rig in the VOX (or closed-PTT) mode, momentarily depressing trigger switch S1 will turn the recorder on and transmit one complete message. Closing either S1 or S2 while the message is being sent will have no effect.

I hope you find that this controller will allow your voice to survive the rigors of future SSB operations. See you in the next contest! ■

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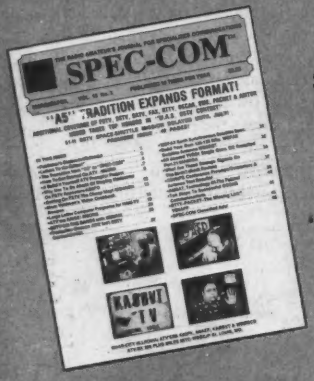

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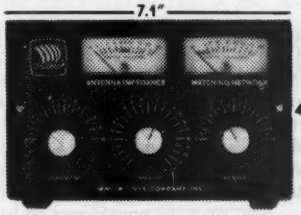

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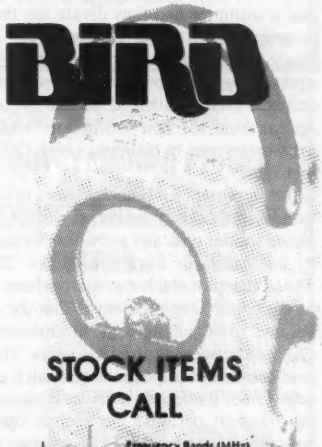

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50 watts	50H	50A	50B	50C	50D	50E
100 watts	100H	100A	100B	100C	100D	100E
250 watts	250H	250A	250B	250C	250D	250E
500 watts	500H	500A	500B	500C	500D	500E
1000 watts	1000H	1000A	1000B	1000C	1000D	1000E
2500 watts	2500H					
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Number 3 on your Feedback card

Contesting and home-brewing are what I like best about ham radio, and it's a lot of fun to combine them from time to time. One problem with contesting is that it can take up a lot of time (much of which could be spent sleeping) if you get really serious about it. This situation helped to create a category known as multi-operator, single transmitter. For the uninitiated (well-rested), the multi-single station allows many people to operate one transmitter and thus divide the time up among them. Another feature of the multi-single class is that two or more people can operate together. In this case, a separate receiver is usually involved, so that the second op can hunt for new multipliers while the primary op tries to maintain a high QSO rate by CQing.

It is important for both operators to be able to listen to either receiver at will. A headphone splitter typically provides this capability but can have some drawbacks. This is where the plot thickens—i.e., where I get to the point. One problem is that the audio volume often changes as headphones are switched between the two receivers. This occurs because of impedance mismatch conditions. Since the second receiver is muted during transmit periods, the second operator does not know when his or her partner might need some help pulling a station out of the noise level, QRM, etc. Herein lies the other problem.

Both of these disadvantages are eliminated by modifying the basic headphone splitter circuit shown in Fig. 1 to that of Fig. 2. The modified circuit could also be useful for casual listening where two operators wanted to listen to the radio without using the speaker. The 3PDT switches provide individual receiver selection, constant impedance matching, and sidetone capability. The 10-Ohm, 1/4-Watt resistors avoid the attenuation problem mentioned above. The remaining set of switch contacts allows the sidetone to be heard whenever the station is transmitting. This feature is provided by the transmit relay in the secondary transceiver.

Relay contacts are only provided for the secondary headphones since it is doubtful that the primary operator would listen to the outboard receiver during transmit. If this capability is desired, the unused relay contacts are available and can be wired in a similar fashion.

Some transceivers have a monitor feature to allow the operator to sample his or her transmitted audio. The output of this device could also be connected to the splitter circuit for SSB operation. This is unnecessary with the newer Kenwood (and some other) transceivers in which the monitor feature supplies both the CW sidetone and the SSB sampling.

Power for this circuit is supplied by a small wall transformer. A three-pin voltage regulator was used since the transformer on hand exceeded the 12-volt maximum allowed by the relay coil. There would be no need for either the transformer or the regulator if the proper supply voltage were available from the transceiver itself.

This circuit made no attempt to incorporate individual volume controls, although a pair of LM-386 audio amplifier ICs would work nicely. A generic amplifier circuit with a gain of 20 is shown in Fig. 3 for those who might be interested. All resistors are 1/4 Watt, and the capacitors should have a minimum voltage rating of 25 V dc.

Building the splitter is straightforward and requires only a box large enough to mount the various components. I used an oversized cabinet to keep the switches from being too close together. This avoids the awkward silence that follows when the secondary operator accidentally switches the primary op's headphones just before the VR1's full callsign is copied!

We were just kidding about the 250,000 points. Sorry.—Eds. ■

Parts List

K1	RS 275-215
J1–J4	RS 274-252
J5	RS 274-346
S1, S2	RS 275-661
All resistors	RS 271-1301

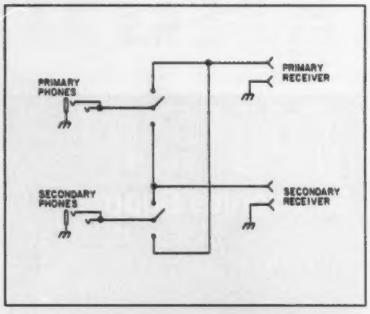


Fig. 1. Simple splitter schematic.

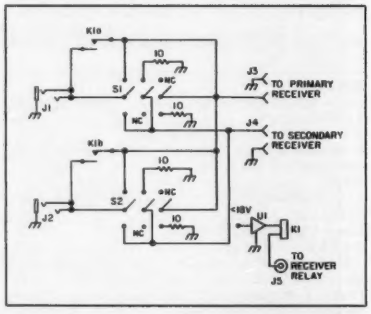


Fig. 2. Improved splitter circuit.

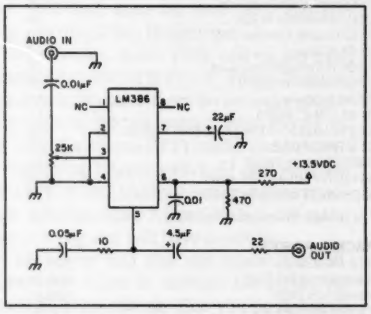
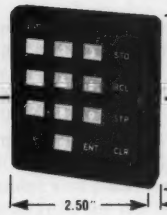


Fig. 3. LM-386 audio amplifier.

COLLINS KWM-380 KEYBOARD



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Number 4 on your Feedback card

Although it is many years past and time has somewhat distorted the facts, I'll probably never forget the first time our group made a stab at operating the ARRL September VHF QSO Party.

It couldn't have started out more auspiciously: Here were three amateurs—Ted WA2OHW, Tim WB2OOQ, and me, WB2OHV—newly licensed as of May, 1970, to wreak mayhem on the bands above 50 MHz. Ted was no stranger to amateur radio, as he had been a Novice some years earlier and operated two-meter AM phone. Tim's experience had largely consisted of blowing up a few home-brew stereo amplifiers and wiring up a Knight-Kit 80–6-meter receiver, which actually worked (oddly enough, considering his gift for demolition)!

Myself? I had been an avid pirate radio operator for about five years, taking clock radios apart and putting 12AV6 tubes on 1600 kHz with varied results. I got bored with it, however, and amateur radio seemed the ticket to more excitement. So the three of us took the test and soon received QSL card order forms with our new callsigns from the Little Print Shop in Texas. (Back in those days, that's how you found out whether you passed or not. It took the FCC longer to let you know than Amateur Electronic Supply!)

Initially, our problem was simple: We had virtually no equipment to operate with. Ted had an old Heath HW-20 "Pawnee" rig for 144–148 MHz. This wonder of the western world featured 10 Watts output from a 6360 tube, AM and CW operation, and the most complicated dial cord stringing job seen by modern man. He used conventional RG-8 to feed a Hy-Gain 15-element "Long John" beam and had a respectable signal. For enhanced receive capability, an Ameco CN-144 converter with nuvistor front end was used, driving a Hammarlund HQ-180AC (with clock option, of course).

50 MHz was a distinct possibility, what with Tim's Knight-Kit and an Ameco 50-MHz nuvistor preamplifier ahead of it. Only problem was we didn't have a six-meter transmitter or antenna! 220 and 432 were definitely out of the question. (1296 MHz was right up there with intergalactic space travel as far as we were concerned.)

The immediate problem: Beef up the two-meter station! And we decided to go all the way (never mind our limited construction experience) and build an honest-to-goodness, fire-breathing kilowatt called the "Plumber's Special" from the 1969 ARRL *Handbook*. My father had a fabrication business and this yielded the necessary tubing and metal for the chassis, not to mention the parts for a three-element six-meter beam from the same handbook. (More on this later!)

> ***"Every fuse in Tim's fusebox erupted in a shower of sparks. It was the 4th of July all over again."***

Tim was assigned to build the high-voltage supply. This was like asking a pyromaniac to design and install a sprinkler system. Ted was put in charge of scaring up a six-meter transmitter, while I drew the enviable assignment of making up the 144-MHz rf deck. The old man helped out with what he could in procuring parts, and I set to work with a nibbling tool to make the necessary holes in the chassis pan.

Incidentally, nibbling tools should be outlawed as cruel and unusual punishment, especially when cutting out three- and five-inch-diameter holes for blower connections! As a result of hours of flexing the damn thing, I could break small rocks apart in my left hand from overdeveloped metacarpal joints!

Construction proceeded at an erratic pace. Tim located the necessary high-voltage components from Fair Radio and the UPS delivery man suffered a hernia delivering the power transformer. It was a whopper, too—1600 volts @ 750 mA. Tim used solid-state rectifiers from Poly-Paks as well as an enormous quantity of computer-grade electrolytics he scrounged from a barrel at a surplus electronics house nearby.

Ted called me excitedly one night: "I've found a six-meter transmitter! It runs 30 Watts output and uses a vfo!" WOW! A vfo. Now we were in the big leagues. The news inspired Tim so much that he managed to blow up his Knight-Kit receiver by inadvertently connecting ac to the antenna input (I told you he had a knack!), thereby setting our ambitious program back one giant step.

I worked feverishly on the chassis, nibbling away in all my free hours. As high school had recessed for the summer, we each had a fair amount of time to "get it all together," but we still managed to spend most of our time at the beach, the movies, and the local pool. Most of our final assembly took place in late August, by which time Tim had managed to finish the power supply. Ted had successfully repaired the dial cord in his HW-20 (lesser men went to insane asylums attempting the same thing), and I had finished most of the rf deck assembly.

Ah, fate. It can be both kind and cruel. Just when things looked so bleak for the six-meter station, my father got the "bug" and dropped three hundred bucks on a brand new Hallicrafters SX-122, which he agreed we could "borrow" for the contest. Hallelujah! It was off to see John Kakstys W2FNT for a six-meter converter from his used equipment collection. After $15 changed hands, we were back in business. I had also finished building the six-meter beam—entirely out of stainless steel. This had to be not only the most durable six-meter beam on the market, it also had to be the heaviest!

Tim called late one Saturday. "The high-voltage supply is done. Let's check it out!" A few minutes later, we were hunched around

the Masonite meter panel, monitoring screen voltage, plate voltage, and plate current as Tim anxiously threw the switch.

KLUNK. FZZZZZZZZZZTTTTTTTTT. POWWWWWW!!!!

Every fuse in Tim's fusebox erupted in a shower of sparks. It was the 4th of July all over again! The basement went black, and the dreaded voice sounded from the top of the stairs: "TIM! You get up here this minute! What have you done to the television!" Ted and I decided to avoid the lengthy lecture that Tim was being subjected to and went back to Ted's house to plot strategy.

It didn't look too good. Here we were, just a week from the contest, and we still didn't have a decent two-meter amplifier. Not only that, Tim had managed to smoke most of the power supply in his demo, and I came to the realization that even if we had finished the amplifier, I couldn't find any 4CX250s on short notice.

Once again, the fates came to our aid. Ted got wind of a used 5894 amplifier and power supply from a local ham, and armed with $25 (probably his life's savings at the time) closed the deal. Now we could run at least 90–100 Watts if nothing else, and there was no work to be done. He set about integrating it into the station, while I borrowed the 50-MHz setup and attempted to tune the beam.

Tim preferred to keep a low profile until the smoke had cleared, then suddenly announced he would not only fix the supply, but locate the tubes and have the amplifier on the air within a week! (Obviously he had delusions of grandeur. Either that or he believed in the myth of the phoenix!) I took it upon myself to make up log sheets and dupe sheets for the two bands. Ted organized the operating position, and we agreed to meet that Friday afternoon to raise the beams.

The latter was an event in itself. Ted's house had a fairly flat roof, but it was pretty inaccessible. We had to climb from level to level with intermediate ladders to access the top and fasten the rotor, mast, and two yagis. All went well until the ladder fell flat on the second level, leaving us stuck on the roof and Tim with no way to get up from the ground! He decided that asking to borrow a neighbor's ladder was too easy, so he came back with some rope and announced he would scale the side of the house to come to our rescue.

It sounded reasonable, except there was nothing to tie the rope to on the rooftop. What to do? You guessed it, we tied the rope to the mast with the six-meter beam and rotor in place. Tim got up to about the second level before the U-bolts on the chimney bracket gave way and the combination of Tim, mast, antenna, and rotor accelerated at 32 ft/sec^2 until they met the ground with a thunderous crash.

Tim somehow came out of it with only a few scratches, but the mast and beam "bought the farm." Again he had dealt our six-meter station a near-fatal blow, and only a quick trip to the fabrication shop for spare mast and element material saved the day. After this, we chose the safer approach and borrowed three ladders from friends—one for each level. A few hours of groaning and grunting and the six- and two-meter beams were finally in place!

Saturday morning dawned. The contest was only a few hours off now, and we worked at a fever pitch connecting everything together—coax, microphones, rotor cable, lights, converters, receivers, headphones. The log sheets were laid out carefully, and about 50 pencils sharpened. Ted thoughtfully located isolated circuit breakers and marked them with a red pen for easy identification. Yep, we were sure in control. The only thing that didn't make sense was the six-meter transmitter setup.

Here was a homemade unit using a pair of 5763 tubes to produce what the owner claimed was 30 Watts output. Actually, it was more like 15 Watts but so what, we couldn't measure it anyway! Tim relied heavily on a Quement Electronics swr bridge ("Good to 150 MHz!" the ads shouted) to ring out the coax lines, and pronounced everything ready. He had also set up the recently deceased HV power supply in another room, determined to get it working during the contest. A call had been made and a local source seemed promising for the 4CX250s, assuming we could work out a trade, so I reluctantly brought along the rf deck to make Tim happy while he wasn't operating. A last-minute search turned up a CW key, and we were ready to take on the world!

"The stainless-steel six-meter beam was not only the most durable beam we'd seen . . . it was also the heaviest."

Five. Four. Three. Two. One. 2 p.m.! Ted keyed the microphone on the HW-20 and turned towards the plate current meter, mumbling "CQ . . . CQ . . . CQ contest from WA2OHW . . . CQ . . . CQ . . ."

Nothing.

Not so much as a slight deflection. Panic gripped our faces. "Tim!" we shouted. "I didn't do it!" came the response from the next room. A few minutes of searching revealed the answer: We'd failed to provide some means of keying the bias from standby to transmit! Out came the soldering gun, and in a few minutes a hastily wired jumper of #16 speaker wire ran from the amplifier to the Dow-Key contacts. AHHH! That was more like it. From our calculations, we were running about 120 Watts input to the 5894. Ted again started calling CQ, and the band came alive with calls (most of them ignoring us).

I went on six meters and the phone rang about two minutes later. "Whaddyatryintadotamytelevision! You kids outta be thrown in jail I can't watch the game what's all these lines all over the screen knock it OFFF!!!" Click. Ah, well. Never liked that neighbor anyway. He drank too much. I persisted calling CQ and the phone rang again, so we took it off the hook.

Ted got lucky and started running stations. Of course, they were all Big Guns, so his run lasted about 20 minutes and ended abruptly. At least we had about 30 stations in the log! Too bad we couldn't work the "Donald Duckers" on SSB! Six meters was dismal. I couldn't hear a thing! A lengthy inspection revealed a bad piece of coax from the converter to the receiver. In addition, the "standby" jumper was in place, muting the SX-122. These problems were soon rectified and in time I actually started hearing signals! This was exciting!

Tim was furiously laboring in the next room, and the smell of rosin floated through the air. Ted switched to CW and managed to have the key disassemble itself into several pieces including two small springs which he promptly stepped on and flattened for good. "Ah, who needs CW anyway. We'll get 'em on phone!" he cried, and proceeded to call CQ for 15 minutes in the CW position. When he dropped the PTT line, we were greeted with "Hey, you lid! Go tune up somewhere else! There's a contest going on!" At last—we were finally getting out!

Ted's mother showed up with much needed hamburgers around 6:30, and we took a break to chow down and assess the situation. I had managed to work a grand total of 16 stations on six meters since locating the bad cables. Ted had piled up 50 stations on two. It wasn't what we had hoped for, but any port in a storm, as they say! Tim was absolutely determined to get the HV supply working, and his determination paid off—he had completed the repairs by 7 p.m. In order to avoid the previous problems with sparking, he had incorporated some sort of "load standby" switch (the function of which escaped me) to protect against a current surge as the bank of 30 capacitors charged up.

It was agreed that we would operate for another two hours, then take a break to test the supply. If everything worked okay, I'd call the local tube source, get the tubes, and with luck we'd be on by that night with a kilowatt. Sounded pretty easy at the time, so Ted went back on two meters and Tim took a shot at six.

Right away it became apparent that something was wrong with the six-meter beam headings. Two meters peaked fine, but six was almost 90 degrees off! It didn't seem possible, and yet—I ran outside. Sure enough, the six-meter "stainless special" had pinwheeled around almost a quarter turn. Another lousy installation job! I informed the guys of our situation and prepared to again climb the roof to effect repairs when Mr. Drunk from next door sprang out from the nearby azalea bush. "You delinquents! I'm calling the police. This is a damned nuisance! I demand that you stop interfering with—" At this point his foot engaged the coiled garden hose by Ted's back door and he went down in a heap on the back lawn. I scrambled

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The 1987 Callbook Supplement is a new idea in Callbook updates; it lists the activity in both the North American and International Callbooks. Published June 1, 1987, this Supplement will include all the new licenses, address changes, and call sign changes for the preceding 6 months.

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back inside, slamming and locking the door behind me.

I'd have to make a try from the second floor. It was definitely hazardous-pay time as I slipped through a bathroom window and carefully stepped along about a foot-wide section of overhang. Upon reaching the end of the window, I managed to slide up the flashing and straddle the roof, edging closer to the beam.

Back in the shack, Ted had hooked into another run of sorts and was logging furiously. Tim still managed to work another ten or so stations off the sides of the beam, and Mr. Drunk gave up and went back to whatever he could salvage of his TV program.

I firmly grasped the mast and stood up, balanced precariously on the roof peak. "Never mind the heights, just fix the antenna!" I thought to myself. I loosened a few nuts and the beam slid down to the rotor cap ever so gently. This would be easy indeed! I removed the mast-to-boom clamps and balanced the beam on the rotor, reaching into my back pocket for longer, stronger clamps.

At that moment, Ted (no doubt caught up in the hysteria of the contest) jerked the rotor to the north, then back south contrary to my instructions to leave it alone. I lost my balance and clutched at the first thing I could grab—the six-meter beam, currently fastened to nothing. Beam and I began a long alpine slide ride down the flashing toward the gutters. As my life flashed in front of my eyes, I also spotted a vent pipe passing by and grabbed hold. The six-meter beam continued by like a stainless-steel avalanche and, with a flourish, flew off the roof to come to a sudden crash on the side of the house. The coax had held! Phewwwww...

Tim chose that moment to come out and inform me of the impending test of the born-again HV supply. He took one look and ran back inside, only to return with Ted and Ted's mother.

"What are you doing up there?" she screamed. I smiled nonchalantly. "Nice view, isn't it?" I said, legs waving in midair. "I'll call the fire department!" she yelled, although Ted persuaded her that that would be unnecessary and soon rescued me with the three-ladder trick.

Now we had a real problem, as the six-meter beam was suspended by an old piece of RG-8 about 15 feet above the ground alongside the kitchen windows. It was decided to take a break and plan strategy as well as test the rebuilt supply.

Tim authoritatively threw the main switch. Again, the hummm and click as before. The lights remained on, however, and the plate voltage meter indicated—lo and behold—2000 volts! He'd done it!

Whatever I thought of Tim's abilities changed at that point, for in the next instant he flipped his "load standby" switch and with an enormous WHUMPPPP the lights in the room dimmed, came up, and started oscillating between on and off at about 60 Hz. The TV picture grew, shrunk, grew again, and shrunk again. The coffee percolator downstairs blew a fuse, the toaster died, the refrigerator ground to a halt, and finally all of the house lights went out in a spectacular flash.

As I sat there in the dark, I contemplated the advantages of stamp collecting. No HV supplies. No antennas. No bad coax. Ted's mother stumbled through the house looking for a flashlight, cursing us to all her ancestors. And at that moment, as if to add a punctuation mark, the coax holding the six-meter beam parted company with its connector, and the beam resumed its appointment with the ground, smashing to pieces seconds later. At least that resolved the six-meter problems!

After much groping in the dark, we managed to reset the tripped breakers and gave up on six meters. Two would be our mainstay for the rest of the contest. We quietly buried the HV supply in the garage and went back to work on two, humbled by the experience.

The evening wore on. We varied the routine with old movies on TV, lots of junk food, and catching sleep here and there. Tim put a yeoman's shift in during the wee hours, and the next morning found us with about 125 QSOs on 144 MHz. The 5894 purred along contentedly and all was well until the rotor stopped.

This was a disaster of major proportions! Losing six meters was bad enough. Tim was dispatched to the attic to locate another hunk of rotor cable Ted "thought" he had left up there. Tim proceeded with haste and began searching the third-floor/attic area. After a few minutes of looking, he swung a door around to check behind it. Click! The door closed in the latch. Clunk! The door handle fell off. Tim panicked and pulled the other knob off, allowing the shaft to drop through to the other side. He was definitely locked in for good!

Ted and I got tired of waiting, thinking Tim had gone back to his house to look for more cable. After about a half hour, we left the shack and went down to the kitchen to get something to eat—far away from poor Tim! His cries for help went unheard as we turned on the television and settled down to stuff our faces.

After about an hour of waiting, we called his house. No, Tim hadn't come home. Hmmm. I tried his neighbor. No, he hadn't seen him. Where could he have gone? Ted decided to look for the cable himself. It was only a matter of time before he found the locked door with Tim flailing away at it trying to break it down. It was HOT in that attic!

Needless to say, Tim lost his appetite for contesting and decided to call it quits Sunday afternoon. Ted and I stuck it out till about 7 p.m. that night when, with four hours to go, the 5894 died. We'd worked about 150 stations on the two bands and nearly 15 sections, so it wasn't a total loss, but it was nearly a year before we decided to try it again!

(Before you ask, yes, the dial cord broke in the HW-20 right as we signed off at the end!)■

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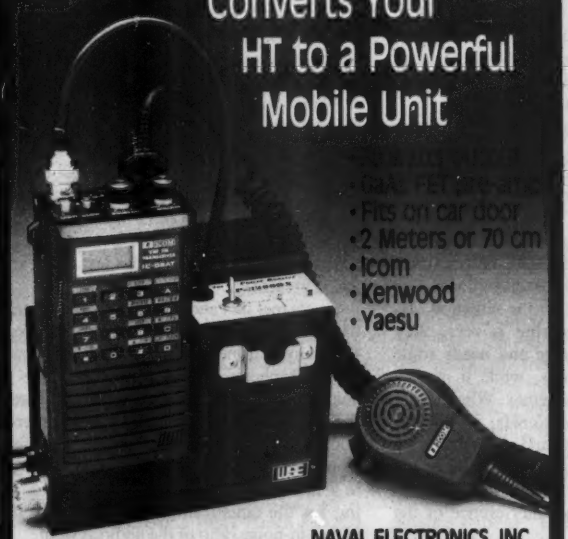

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Everybody Equalize!

2 kW into a four-element monster at 90 feet, and still nobody answers your call! Maybe it's because they can't understand what you're saying . . .

Number 5 on your Feedback card

Bob Heil K9EID is the president of Heil, Ltd.

Back in the AM days, it seemed as if everyone was conscious of his audio quality. Many of the signals you tuned across had better audio than the local broadcast stations. Solid lows, crisp sparkling highs, and no distortion—just good, clean, understandable audio. What ever happened to those operators? Most would hasten to answer that SSB came into being and destroyed that great ability to have super audio. Yes, SSB did restrict the bandwidth from around 6 kHz down to 3 kHz. But as time progressed, it seemed as if this bandwidth just continued to get smaller and smaller.

SSB didn't ruin great audio. The biggest factors in the decline of super audio are improper equalization of the microphone line and the transmitter audio-input parameters.

Two-Year Study

A two-year study of the 160-, 75-, 40-, and 20-meter bands has just been completed using very high quality audio analytical equipment. The engineers performing this important study were not amateur radio operators, but professional sound reinforcement technicians and recording studio engineers. Their studies are very interesting—if not shocking! Almost 70%—yes, 70%—of the SSB signals on the air today have very little, if any, audio response above 1800 Hz! Most of these have a huge peak of +10 to +12 dB at 500 Hz and lower, which ends up giving an audio response that looks like a ride at Disneyland, instead of a nice smooth response with a slight rise in the top end for that added punch and clarity so vital to cutting through the pileups.

The first move of an operator who becomes aware of an audio problem is to try a compressor, or clipper, trying to "clear up" these gross problems of improper equalization. In the majority of cases, these types of electronic devices aggravate the problem—their operators don't fully understand how to use them. This causes low-level microphone circuits to be overdriven into horrible clipping, thereby causing massive distortion. The mike inputs of most transmitters are set up to accept 40 to 50 millivolts maximum. Most of these compressors or processors (if you wish) are capable of producing well over 2 volts! In addition, they do very little to improve the lumpy frequency-response curve and simply add distortion as the preamp is overloaded.

Equalization

It is apparent from all of the studies that equalization is the answer. One can use practically any microphone and equalize it to sound perfectly natural on any transmitter. With active equalization, you can adjust the amount of high and low frequency response as needed for a given microphone/transmitter/voice combination.

Recording studios and broadcast transmitters, not to mention telephone lines, PA systems, etc., use some form of equalization to flatten out and equalize the response curve so that you hear the voice as a natural sound, not one filled with extra frequencies and harmonic distortion that have been added by improper electronic equipment.

Bell Laboratories has been studying the phenomenon of human hearing for years. It is a continuing process with this great laboratory to help us understand what we hear and why we hear it. Without any type of equalization in our microphone lines, the transmitter merely sends the audio responses that the microphone and speech audio preamp for the transmitter add to the situation. As Bell concluded, our hearing is very, very sensitive in the mid-range and needs some help in the upper regions, while it is very deficient in the lower extremes. When trying to copy the majority of signals, you'll find they do not have enough mid-range and high responses to them. Most exhibit entirely too much low end and therefore are impossible to pull from the noise and interference of the adjacent signals.

The EQ-300 Microphone Equalizer from Heil, Ltd., can be used to correct this problem. The device has two active audio filters: the low filter at 490 Hz and the high filter at 2400 Hz. Both are capable of a 20-dB boost and a 20-dB cut at those two frequencies, so that equalization of a microphone becomes very easy by simply plugging the microphone into the equalizer and connecting the output of the equalizer into a transmitter's microphone input. Listening to a second receiver (using headsets) while transmitting will allow the operator to equalize the microphone response easily.

Proper Microphone Technique

It is very important to use proper microphone technique to avoid extraneous background noises. Ever tune across somebody and notice that the fan in his amplifier blower is louder than his voice? His explanation that the fan is loud or that he is "running a lot of power" is not the correct explanation of the situation. He is usually speaking 12″ to 36″ from the microphone with the mike gain cranked and the unequalized processor wide open, causing the background noise in the room to be louder than his actual voice.

Microphones for communication were designed to be very close-talked. It is not proper to sit back away from a microphone and expect to have that commanding signal on the band. The important mid-range frequencies are lost, the highs are diminished, and what gets left are many of the lows and much of the room resonance that overrides just about any audio present.

To correct this and ensure that your signal has that terrific mid-range punch, free from the many extraneous background noise, run the microphone gain as low as possible to achieve good ALC action and speak no more than one to two inches from your microphone. It is the accepted practice in professional communications and it is the only way to achieve good solid audio. This does nothing for the equalization, but does help the signal-to-noise ratio of the audio system.

Microphone Cartridge Response

Surprisingly, the majority of microphones

sold to the amateur radio market are not built by those manufacturers whose name brand they carry. There are only two major manufacturers—in the Orient—that are building most of the microphones. As long as a mike is the same color as a rig and has the correct connector, it is advertised as "matching"—with absolutely no consideration being given to the response, drive, or overall characteristics for use in the amateur radio market.

The majority of microphones are dynamic and produce a very bassy, muddy response. Some of the newer microphones are electret and are even worse in response. Electret elements are very cheaply built and widely used due to the high profit they can produce.

The old crystal and ceramic microphones had wonderful audio responses when used with the older tube rigs. Those cartridges were several million Ohms in impedance and, of course, the tube inputs were also typically 2 to 3 million Ohms, so everything was super sounding. However, here we are in 1986, and all rigs built today use solid-state audio preamplifiers that have, typically, 800 to 1500 Ohms input.

Plugging the wonderful old 1935 D-104, an extremely high impedance microphone, into the new rigs places that cartridge in an almost direct-to-ground short, which does horrible things to this great old microphone. First, the drive is greatly reduced, which is no big deal. However, this terrific mismatch (3 million Ohms to 800 Ohms!) rolls off the low end of the audio and puts a ridiculous peak in the mid-range, making the response sound like a telephone. Yes, it is easy to understand in the pileups when compared to the "stock" dynamic, but it only allows the bandwidth of your signal to become less than two octaves and this just doesn't give you the commanding signal needed in the pileups.

Power Bandwidth

It is important to realize that just having a wattmeter in line doesn't tell the whole story. If you use a microphone that has an extremely peaky audio response, the majority of your power will be at that frequency. Using a stock dynamic mike means that usable parts of your power will be in the low-frequency, muddy-sounding part of the spectrum when your brain is searching desperately to hear from 1500 through 2200 Hz, so the articulation of the words can be understood. Did he say a "P" or a "B"? Was it an "F" or an "S"? Without the proper balance of highs and lows, the brain can't distinguish this—no matter how much power you are running.

100 Watts Beats Out The Big Signal

To really drive this subject home, after several years of study we erected two TA-33 beams at 60′ on separate towers. A stock TS-820S with Kenwood's "matching" MC-50 microphone drove a stock Heath SB-220 amplifier. The second station, located on the same test bench, was a Kenwood TS-120, which was driven with a Heil HC-3 "key element" and the EQ-200 Microphone Equalizer. A $20,000 audio analyzer was attached to the TS-120 and the audio was equalized for maximum response, keeping the Fletcher-Munson curve of the human ear well in mind.

Two amateurs operated the test stations. One station was properly equalized and produced 100 Watts of power into the antenna from 300 to 2400 Hz, with a 10-dB rise at 2200 Hz. The second station was producing 800 Watts of rf from 200 to 1400 Hz, but the output was less than 100 Watts at 2200 Hz. Both stations entered a pileup on the same frequency calling some European stations. In four separate runs, the 100-Watt station was answered first. On the fourth run, the foreign amateur was asked why he answered the smaller station: "Didn't you hear my friend standing here beside me running nearly the legal limit?" The response from the European was, "I couldn't understand any other signals in the pileup but yours!"

The reason for this was that the properly equalized station actually had more talk power at the frequency response that the human ear needs to receive—which made it easier for the brain to make those articulate decisions as to what was said. Stacked KT-34s and parallel Alpha amps are just *not* necessarily the answer. So many times you will hear fellows make that ridiculous assumption—the more power, the better. What we all should learn and learn well is that it is not how much power you are running that makes the difference, but what the audio power bandwidth of that power is.

Become aware of proper audio response. Remember: Hearing is a physical process; listening is a mental process. Become a good listener—improve the sound of your signal and help clean up our airwaves. Art Collins never intended for SSB to deteriorate to some of the signals you can tune across today. ■

EQUALIZATION FOR CONTEST AND DX OPERATION

I recently learned about audio equalization of amateur radio signals, and frankly my first thought was "here we go again, another gadget to clutter up the ham shack." Interestingly, though, I searched further and was able to learn more from Bob Heil, guru of high-quality concert audio systems.

Yes, I do have an MC-50 Kenwood microphone. I bought it because it looked flashy and I assumed that Kenwood designed it for amateur use, but I apparently was wrong. I performed several experiments and found that Heil's treatment of covering the ports of the mike helped the performance by rolling off some of the unwanted low end. In reading several articles by Heil, I thought perhaps there was something to all of this. I was never concerned or even knew about sibilance (the ability of an acoustic system to reproduce without distortion the extreme high frequencies that contain the "S" and "T" sounds). Even with the gimmick-fixed MC-50, I did not get that needed sibilance.

In short, I obtained one of Heil's EQ-200 Microphone Equalizers for testing. To perform the test, I developed a list of words that could be very confusing if the "S" and "T" sounds were missing (Category A). Also, I included words that contained a dipthong (Category B), which requires an extraordinary "puff" of air—enough to drive an unequalized bass-emphasizing mike like the MC-50 or MD-1 crazy. A partial list of words utilized follows:

Category A			Category B	
steam	score	strip	trash	throw
speak	sink	scream	thicket	thrust
scab	space	send	tweed	thwart
scar	stop	tact	twig	throng

These words were utilized in an on-the-air test conducted intentionally under less than ideal conditions—lots of QRN and QRM. During the tests, the listeners were requested to record what they heard and read it back. With the Heil equalizer in line, the listeners were three times more likely to hear correctly what was said.

It must be stated that most listeners first stated that they liked the sound of the MC-50 unequalized, as it sounded more like me. I attributed their preferences to the fact that Americans equate bassness with quality and that they were not used to flat or "equalized" audio. In fact, many thought I was running a processor. Interestingly, a processor in effect eliminates the overemphasized bass of most microphones by clipping it out. Unfortunately, the combination of overdriving the speech amplifier of the rig with overdriving the processor causes much of the distortion and splatter on today's crowded bands. Thus, one should equalize the microphone first, then process it if necessary.

We also tested the EQ-200 equalizer with the Pro Com 200 headset and a Drake microphone, which had the original Astatic element removed and replaced with a new Heil HC-3 "key element," which is a specially tailored element for amateur communication. The HC-3 and the EQ-200 equalizer combination produced studio-quality audio.

To be sure, the equalization of a microphone is not in the same category as a 2-kW amp or a 150-foot tower, but the audio must be right for those items to be most effective. The additional clarity provided by the higher quality Heil audio made my venture into the North American SSB Sprint very successful. Even in that fast-moving contest, three contestants stopped long enough to mention that I had excellent audio!

Denny Burgess K8DB

Michael R. Meltzer K2SDD
121 Clearview Road
DeWitt NY 13214

This Pileup's For *You!*

You don't have to fly to the ends of the earth to have a popular signal. Here are three tricks to bring the screaming hordes onto your frequency.

Number 6 on your Feedback card

Have you ever felt envious listening to a DX station that was underneath a gigantic pileup? The popularity must be great fun—with so many people yelling and screaming into their microphones or pressing their CW keys right through the table top. Would you like to experience the fun of having the guys (and gals) standing in line just to work you, too? Well, it can happen, and you do not have to go on an expedition to a coral reef or a northern iceberg—it's easier than you think.

You do need at least an average signal for the techniques I am going to describe. Even a real DX prize cannot create a pileup if no one can hear him. So let us assume you have a few hundred Watts and a good antenna. If you're willing to answer lots of QSLs, you're ready to go.

Take Off

Go where? My first suggestion is to go on a little DXpedition to Vermont, Delaware, or Wyoming. These states contain only around 800 licensed hams each, which is much less than most DX countries. Even Hawaii has twice as many. Because we live only a few hundred miles from them, we may not realize how much in demand these little states are to our brothers in Europe and Asia. Go there and put out a reasonable signal on 10, 15, or 20 meters and watch what happens. They will crawl all over each other to work you and get a QSL card.

Novice DX

If you cannot leave your home QTH, there are other ways to attract a crowd. Many European countries and Japan offer Novice-type licenses with power limits of only 10 Watts or less. If you are running 200 Watts and you have a hot enough receiver so you can hear them, they will hear you for sure and you will have a 13-dB advantage that will attract them faster than you can work them. This works well on CW. I like 15 meters best. Be sure to keep your code speed down because these guys are beginners. And in case you haven't guessed, every single one of them will want QSLs from the DX states of New York, California, and Texas.

Be A Personality

My third suggestion for attracting a pileup is to become a special personality. King Hussein of Jordan attracted pileups on 2-meter repeaters when he visited California. Barry Goldwater is in such demand that he hires a staff to run his station. And Arthur Godfrey . . . well, what can I say? But if you cannot become a great politician or a king, what can you do?

"When he called CQ, he would add: 'No lids, no kids, no YLs, no XYLs, no bus drivers, no hitchhikers, no space cadets, no phonetics.' "

I'd like to describe some special personalities I have contacted and you will see. There was John King of the giant King Ranch in Texas who used to frequent 15-meter phone. John had a very powerful and very attractive Texas accent. When listening to his voice, you just knew that he was the fastest, straightest shot west of the Pecos.

John's voice and quick wit made him a real Pied Piper. He kept his QSOs very short, so no one could get to know him too well, and this added an air of mystery to the "stranger from Texas." As soon as he said "so long" to his contact, the frequency would explode with callers. If you practice your Texas accent for a few weeks and develop a handful of original phrases, you will be ready to take over where John King left off.

As for me, I have always found that the voice and personality of my friend Damon WB2PEL strongly attracts my attention. Damon can do "a John King" without even trying. But the rest of us may need a little practice first. While you are at it, why not become proficient as John Wayne, Humphrey Bogart, or Peter Lorre? I have been told often that I sound like Dick Cavett, but that has yet to create pileups around my signal. Most people just tell me I sound familiar, but they are not sure why.

Back in the 1950s, I encountered the most famous personality of 75-meter phone in the East. He was W2OY from Lancaster, New York, "the man we loved to hate." Mike would make a practice of being the most critical and grouchiest stinker on the band. He was *mean!* When he called CQ, he would add: "No lids, no kids, no YLs, no XYLs, no bus drivers, no hitchhikers, no space cadets, no phonetics." He was *rotten!*

When he was in QSO, the lids would swish their vfos back and forth to QRM him. The "kids" even recorded his signal and replayed it outside of the band. He was *hated!* But he got a lot of attention and a lot of QSOs. The first time I talked to him, he criticized me strongly for asking, "How do you copy?" "You only *copy* CW," he told me.

After a few more contacts with Mike, I began to suspect something. And when I met him at the Rochester Hamfest, it was confirmed: It was all a big put-on. W2OY was one of the nicest guys you would ever want to meet. But over the air, his many friends never let on. We were saddened to learn of his death which was caused by a heart attack while he was up on his tower many years ago. Who will be the next W2OY? Perhaps it could be you.

So you see, if you want popularity on the ham bands, there are many tricks that work. Tell them you are using solar power. Tell them you are trying to break the Guinness record for QSOs while standing on your head. Tell them you are Jimmy Cagney or Boris Karloff. But don't use Dick Cavett—that one is mine. ■

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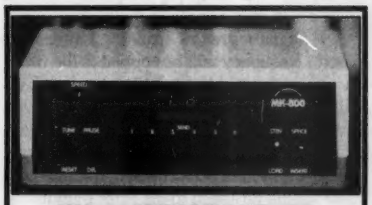

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Narrow-Minded Filtering

Spend fifteen minutes tinkering with this switched-cap filter for CW: You'll wonder where all of those signals came from!

Number 7 on your Feedback card

Did you ever find yourself in need of a good CW filter? Not just one with a narrow passband at −3 dB, but one with a narrow passband at −40 dB? Well, read on.

The filter I'm talking about has a passband of about 300 Hz, doesn't take up much room, can be run off 9-volt batteries (it takes two), and uses a new approach to the old active filter. One other thing: There are only two chips in this project. One is the RF-5614 filter, the other is a waveform generator.

Now for the filter. The RF-5614 is a monolithic switched-capacitor bandpass filter packaged in an eight-pin mini-DIP. The IC contains a six-pole Chebyshev ANSI class-II bandpass filter using an external-input clock trigger. The center frequency of the filter is tunable by the clock frequency. The distortion can be less than 0.1% with a dynamic range better than 86 dB. The filter will handle input signals of greater than 17 volts p-p with an insertion loss of less than ±0.2 dB.

Some other features are that it is small, it requires no other external components, and the power-supply range may be ±5 volts to ±10 volts. (I used two 9-volt batteries.) The corner frequency range is from 10 Hz to 25 kHz.

Operation

The bandpass filter is self-contained and requires only an external clock trigger and a plus and minus power supply. Because the clock trigger sets the control frequency of the passband and also the sampling rate (27 times the control frequency), I will address this first.

As with any sampled data system, signals above half the sampling frequency will be aliased and may appear in the band of interest. If signals greater than 13.5 times the control frequency will be applied to the filter, an external anti-aliasing filter may be required. I found this to be true (as can be seen in the low-pass RC filter on the output in Fig. 1). In applications where the clock residue may affect system performance, a single-pole filter should be added to the filter output.

The trigger-clock frequency is twice the sample rate, or 54 times the center frequency. For a 1-kHz center frequency, the clock must be 54 kHz. The input clock is divided by two in generating the on-chip clock waveform that controls the sampling rate.

One note before moving on: This device is a MOS device and handling precautions

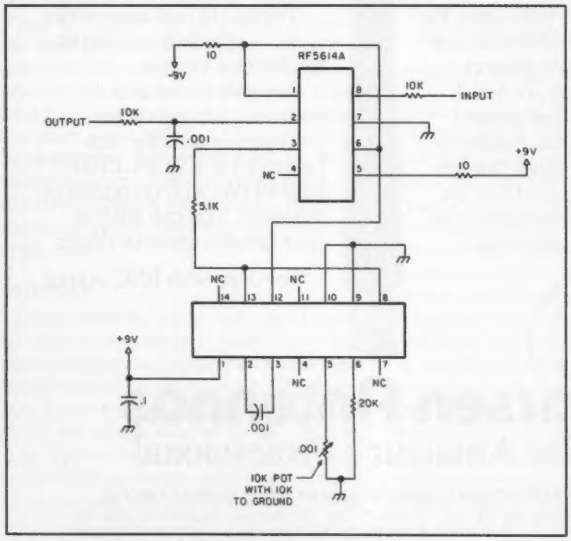

Fig. 1. Schematic of the CW filter.

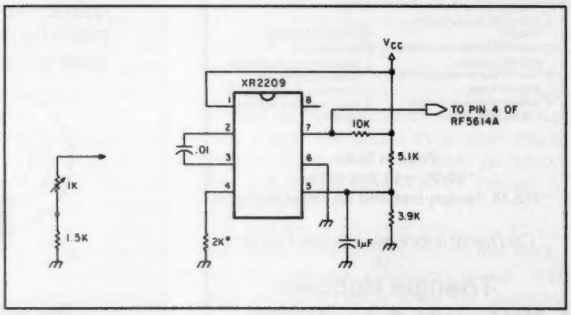

Fig. 2. An alternate clock circuit using the XR-2209. Replacing the 2k-Ohm resistor on pin 4 with the 1.5k/1k pot combination lets you adjust the center frequency from about 790–1320 Hz.

should be used. Don't apply instantaneous supply voltage to the device or insert or remove the device from its socket while it's on. Decoupling networks were added for turn-on/turn-off switching transients and ripple. (There's no ripple with batteries, but I may want to add a dc supply later.)

Trigger Clock

For the trigger-clock, I used an XR-2207 voltage-controlled oscillator chip. The XR-2209 could also be used, but the pinouts are not the same. The power supply can be up to 26 volts from a single or split 12-volt power supply.

Inside the XR-2207 are four main functional blocks for frequency generation: a voltage-controlled oscillator, current switches that are activated by binary-keying inputs, and two buffer amplifiers for triangle- and square-wave outputs. The vco is actually a current-controller oscillator which gets its input from the current switches.

As the output frequency is proportional to the input current, the vco produces four discrete output frequencies. Two binary-input pins determine which timing currents are channeled to the vco. These currents are set by resistors to ground from each of the four timing terminals—pins 4, 5, 6, and 7.

Using the XR-2209

The circuit shown in Fig. 2 will produce an output frequency of 54.21 kHz which, when divided down inside the filter, will give a center frequency of 1.003 kHz (54.21 divided by 54). The center frequency could be set lower or higher by replacing the 2k resistor with a 2.5k, 10-turn pot. Using a 2.4k fixed resistor, the output frequency will be 43.1 kHz, giving a center frequency of 798 Hz.

When using a split power supply, pin 6 has the negative voltage and pin 5 is grounded. A 0.1-nF capacitor should be placed between pins 6 and 5. All other parts stay the same. This description is for the XR-2209 only and not for the XR-2207. For the square-wave output (pin 13), the device is an open collector and is pulled up with a 4.7k resistor.

Parts List

2	10 Ohm, 1/4 W	RS 271-1301
3	1k Ohm, 1/4 W	RS 271-1335
1	5.1k Ohm, 1/4 W	Mouser PN 30BJ250 5.1k
1	4.7k Ohm, 1/4 W	RS 271-1330
1	20k Ohm, 1/4 W	Mouser PN 30B5250 20k
1	10k pot	RS 271-1721
1	.001-nF, 50-V capacitor	RS 272-126
2	.1-nF, 50-V capacitors	RS 272-135
1	FR 5614-A	EG & G Reticon
1	XR-2207	EXAR Corp.
1	Aluminum utility case	RS 270-286
1	Experimenter's IC board	RS 276-161

1. Radio Shack.
2. Mouser Electronics, 2401 Highway 27 North, Mansfield TX 76063.
3. EG & G Reticon, 345 Potero Avenue, Sunnyvale CA 94086.
4. EXAR Corp., 750 Palomar Avenue, Sunnyvale CA 94086.

To the Pileups!

Now that you know how each device works, you can put them together to make a nice filter with a passband of about 300 Hz from the −3-dB points. Layout is not critical. I used a piece of 1″ x 4-1/8″ experimenter's IC board from Radio Shack (# 276-161) and put the filter into a utility case.

I think that you'll enjoy building and using this little filter. See you in the pileups on 20! ■

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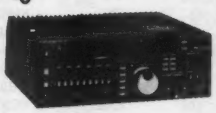

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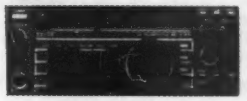

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1987 WORLD SSB CHAMPIONSHIPS

Announcing the January Classics—the 1987 running of the World SSB Championships! The first and only contests of their kind, these six individual single-band events are world-renowned and amongst the most challenging events on the bands today. Winners of each contest determine the World Champion for 10-, 15-, 20-, 40-, 75-, and 160-meter single sideband:

0000 UTC January 3, 1987 through 2400 UTC January 4, 1987
1st 10-Meter World SSB Championship

January 10, 1987
0000–2400 UTC
3rd 15-Meter World SSB Championship

January 11, 1987
0000–2400 UTC
3rd 20-Meter World SSB Championship

0000 UTC January 17, 1987 through 2400 UTC January 18, 1987
5th 160-Meter World SSB Championship

January 24, 1987
0000–2400 UTC
6th 40-Meter World SSB Championship

January 25, 1987
0000–2400 UTC
6th 75-Meter World SSB Championship

MISC. RULES:

Stations may be worked only *once per event*. All contacts must be two-way SSB transmissions. All stations, regardless of their operating class, may operate entire contest periods without a rest period.

OPERATOR CLASS:

(a) Single operator, single transmitter, SSB only. (b) Multi-operator, single transmitter, SSB only.

EXCHANGE:

Stations within the continental 48 U.S. states and 13 Canadian provinces or territories transmit RS report and state, province, or territory. All others, including Alaska and Hawaii, transmit RS report and DX country.

QSO POINTS:

5 QSO points for contact within your own continent, 10 QSO points for contact outside your own continent.

MULTIPLIER:

1 multiplier point is earned for each continental U.S. state (48 max.), Canadian province or territory (13 max.), or ARRL DXCC country (excluding the United States or Canada).

DX WINDOW:

For the purpose of this event, DX window frequencies are reserved for *split-frequency operation only*. W/VE stations are not to transmit in the DX window. DX stations may transmit in the DX window but *must* receive *outside* window frequencies. DX Windows: 7.060–7.090; 3.790–3.805; 1.825–1.830; 1.850–1.855, and 1.907–1.913 MHz.

FINAL SCORE:

Total QSO points x multiplier points = claimed score.

CONTEST ENTRIES:

Entries must include (1) a contest log, (2) a dupe sheet for 100 or more contacts, (3) a list of multipliers, and (4) a summary sheet as outlined below. Be sure to include your soapbox comments and a black-and-white photo for possible publication.

SUMMARY SHEET:

Summary Sheets must contain (1) contest callsign, (2) your QTH, (3) station owner's name and address, (4) a list of station equipment and antennas, (5) operator class, (6) total QSO points, (7) total U.S. states worked, (8) Canadian provinces and territories worked, (9) the total of ARRL DXCC countries worked, (10) total multiplier points, (11) claimed score, and (12) if a multi-operator station, a list of participants, by callsign.

ENTRY DEADLINE:

Mail contest entries separately to the contest chairman listed below. Entries must be *postmarked no later than February 18, 1987*. Late entries will be registered as check logs.

DISQUALIFICATION:

Contestants may be disqualified if they run illegal power, cause deliberate interference, fail to comply with the DX window rules, attempt to achieve a scoring advantage, or if the number of duplicate contacts not cancelled exceeds more than 3% of the total contacts made. Contest committee decisions are final.

PENALTIES:

A penalty of 100 QSO points will be assessed for *each* duplicate contact counted in a contestant's claimed score.

AWARDS:

A minimum of 100 QSOs must be worked in an event to be eligible for certificates. Plaques will be issued to World Championship stations who work a minimum of 500 contacts. Awards will be issued in each operator class, in each continental U.S. state, Canadian province and territory, and ARRL DXCC country represented.

Overall Winners—Single Op:			
USA	WB9HAD	86	539,250
Canada	VE3CDX	84	318,150
DX	I4OUT	85	188,415
Overall Winners—Multi-Op:			
USA	KM5X	86	585,945
Canada	VE2CAR	83	61,380
DX	LZ2CJ	84	142,080
W/VE Stations—Single Op:			
AL	KX4X	84	195,900
AR	WA5NFC	86	126,990
AZ	WB7FDQ	82	71,285
CA	K6SE	83	191,750
CO	KØRF	84	309,760
CT	W1ODY	85	228,690
DE	AA1K/3	83	266,660
FL	K4AQQ	83	173,600
GA	W4VKK	82	106,020
IA	WØEJ	85	401,580
ID	KA7T	85	21,250
IL	WB9HAD	86	539,250
IN	W9RE	82	371,580
KS	N7DF/Ø	84	344,650
KY	N4ICS	85	76,055
LA	WB5WAK	85	18,725
MA	W1CF	82	236,280
MD	W3YOZ	86	417,730
ME	KA1PE	83	95,975
MI	KC8P	84	331,695
MN	WØHW	82	60,435
MO	KCØQO	85	5,940
MS	N5GDO	85	68,160
MT	K7VIC	84	231,570
NC	W4TMR	86	246,300
NE	KØHA	84	309,070
NH	W1RR	84	302,400
NJ	W2FCR	84	222,300
NM	W5YZ	82	92,950
NV	KA7BRE	84	87,480
NY	WA2SPL	84	490,985
OH	KC8JH	84	337,050
OK	N5CG	83	185,135
OR	WB7OZM	82	32,980
PA	W3TS	86	231,680
RI	KA1SR	85	133,650
SC	N4LTA	86	88,510
SD	KØSTI	83	132,000
TN	KC4OV	82	130,140
TX	N5JB	83	180,600
UT	N7DF	82	103,880
VA	WD4KXB	85	211,575
VT	WB1GQR	85	139,690
WA	W7AWA	85	104,550
WI	WA1UJU	86	197,800
WV	WBLRL	82	350,700
WY	W7FT	83	50,500
ALT	VE6OU	82	19,995
BC	VE7CRU	83	76,755
MAN	VE4WR	82	43,120
NB	VE1BRA	84	18,850
NS	VE1YX	83	69,720
ONT	VE3CDX	84	318,150
PEI	VE1BPY	84	22,050
QUE	VE2ZP	82	75,900
SASK	VE5RA	86	146,160
YUK	VY1CW	86	1,860
W/VE Stations—Multi-Op:			
CA	N4ARO/6	84	31,980
CO	KBØTJ	83	175,200
DE	AA1K/3	82	75,525
FL	WA4JXI	85	250,995
IL	K9YUG	82	152,400
IN	K9ZUH	82	213,280
KS	WØCEM	86	453,590
KY	W4SEL	86	371,515
MI	W8RA	86	364,000
MN	WØSW	84	83,640
NJ	WV2ZOW	86	64,500
NY	WA2SPL	83	325,230
OH	WB8IFP	86	584,825
OR	NK7U	85	207,675
PA	KC1U	86	475,475
RI	WA1ZEB	83	75,670
TN	N4FNB	86	200,760
TX	KM5X	86	585,945
VA	NZ4B	83	65,280
VT	WB1GMG	83	61,740
WA	K7LXC	85	82,080
WI	WB9SLR	84	137,535
QUE	VE2CAR	83	61,380
DX Stations—Single Op:			
Alaska	KL7XO	84	1,740
Andorra	C31OF	85	30,100
Argentina	LU9EIE	83	5
Austria	OE1DH	86	22,185
Balearic	EA6ET	82	5,130
Barbados	8P6KX	82	1,490
Bermuda	VP9BO	82	51,200
Bulgaria	LZ1KOZ	85	20,105
Cayman Is.	ZF2DX	82	21,150
Czech.	OK3CZM	86	39,760
England	G3XTT	84	25,560
Germany (E.)	Y24AK	86	1,050
Germany (W.)	DL7MAE	86	12,360
Hawaii	KH6IJ	82	2,175
Italy	I4OUT	85	188,415
Ireland	EI4DW	84	8,820
Mexico	XE2NNZ	86	11,610
Poland	SP5INA	84	35,650
Portugal	CT1AFN	86	4,250
Spain	EA3CCN	85	72,580
UN HQ	4U1UN	85	25,625
Venezuela	YV2IF	85	109,800
DX Stations—Multi-Op:			
Bulgaria	LZ2CJ	84	142,080
England	G6HH	85	25,680
Germany (W.)	DF5ZD	82	3,135
Yugoslavia	YU7JDE	83	3,680

Table 1. 160-meter all-time record holders. (Columns show QTH, callsign, year, and score.)

WB9HAD, the 160-meter single-op champion.

The ops at W0CEM "steak" their claim to a fourth place 160-meter multi-op finish. From left to right: AB0S, K0WA, WA0TKJ, and W0CEM.

W4SEL says that dupe checking over 1,000 160-meter QSOs is the pits.

160-METER WORLD SSB CHAMPIONSHIP CONTEST

Callsign, QTH, QSOs, states and provinces, DX countries, total score
** = World Champions; * = State, Provincial, Country Champions

**	WB9HAD	IL	1,431	59	16	539,250
*	W3YOZ	MD	1,106	56	18	417,430
	K3ZO	MD	1,030	61	19	405,990
*	KC8P	MI	1,050	56	7	322,385
*	VE3NNR	ONT	897	56	13	315,350
*	W4TMR	NC	887	53	7	246,300
*	K7VIC	MT	743	57	4	246,300
*	W3TS	PA	722	—	—	231,680
*	K2RIH	NY	570	55	20	221,250
*	W2FCR	NJ	581	—	—	219,385
*	W0EJ	IA	701	54	5	208,270
*	WA1UJU	WI	776	51	0	197,880
	W3BGN	PA	563	—	—	195,500
*	K6HNZ	CA	565	54	11	187,525
*	VE5RA	SASK	463	55	8	146,160
*	AD0J	CO	444	54	6	136,335
*	WA5NFC	AR	498	49	2	126,990
*	KA1SR	RI	313	51	17	110,840
	NF4C	NC	377	44	9	102,290
*	K7QQ	WA	340	54	4	99,180
*	N4LTA	SC	334	53	0	88,510
	KF4HK	NC	261	56	11	87,040
	KA8T	MI	389	43	1	86,020
*	KK9G	IN	365	41	2	78,475
*	N8ET	OH	299	49	1	74,750
*	KV0I	NE	296	60	0	74,000
*	W4UWC	TN	274	50	3	72,610
*	N7FMB	VA	328	41	3	72,160
*	KE5WO	MS	291	49	0	71,295
	N3EHD	MD	264	50	3	70,498
	W9MQZ	WI	313	50	1	69,815
*	VE4JB	MAN	257	50	2	66,300
	W7AWA	WA	275	47	1	66,240
	K2FL	NJ	233	45	9	63,990
	VE4WR	MAN	205	52	2	55,890
	W1MX (KA1SA op)	MA	220	41	6	51,935
	N4HQT	TN	258	35	2	48,100
	K8SVT	OH	214	44	0	47,080
	N4BSN	TN	169	50	4	46,440
	KA2CDJ	NC	199	43	5	45,770
*	KD5VU	TX	163	48	7	44,825
*	KI4M	AL	180	45	3	43,440
	N0AKC	WI	181	48	2	42,250
	VE3OZ	ONT	212	35	2	39,590
*	VE2DTI	QUE	176	41	3	39,280
*	K8HVT	CT	156	39	6	35,550
*	KI4UJ	KY	161	44	0	35,420
	KC2KK	NY	191	36	0	34,380
	W4KMS	VA	135	45	0	31,275
*	W4WKQ	FL	134	40	2	28,140
	W2CVW	NJ	138	39	0	26,910
*	W8VEN	WV	132	39	1	26,400
	KG9D	IL	121	43	0	26,015
*	KA1SA	MA	126	37	3	25,400
	W4XT	KY	115	37	3	23,800
	N5AFV	TX	106	35	1	19,080
*	KB8KW/7	WY	100	35	1	18,180
	VE2QO	QUE	109	33	0	17,985
	W3ARK	PA	108	27	0	14,580
	VE3CWE	ONT	80	35	0	14,000
	VE1TE	NB	87	31	0	13,485
	KQ1F	MA	68	33	1	12,410
	W9RE	IN	71	33	0	11,715
	W4HVU	NC	61	25	2	8,505
	W3SOH	VT	65	22	0	7,150
	KW2J	NY	55	24	0	6,600
	N9KS	WI	44	25	0	6,500
	K5GN	TX	47	22	1	6,240
	WA6FGV	CA	77	14	1	5,850
	N8CUX	OH	39	20	1	4,095
	K7LXC	WA	31	15	0	2,325
	VY1CW	YUK	31	12	0	1,860
	W4UXC	GA	21	17	0	1,785
	NF2C	NJ	19	12	0	1,140
	WA5KBH	LA	17	10	0	850
	VE3IHB	ONT	11	8	0	440

(The following stations cited total multipliers and failed to distinguish between W/VE and DX: W3TS—64 total multipliers, W2FCR—73 total multipliers, W3BGN—68 total multipliers.)

DX—Single Operator:

**	EA3CCN	Spain	196	7	35	44,100
*	OK3CZM	Czech.	188	1	38	39,780
	OE2DH	Austria	121	0	27	22,815
	OK1JDX	Czech.	108	4	30	20,060
	OK1AJN	Czech.	120	1	30	18,600
*	DL7MAE	FRG	100	0	24	12,380
	OE3HCS	Austria	122	0	20	12,200
*	XE2NNZ	Mexico	129	18	0	11,610
	G3UEG	England	80	1	23	9,720
	I4CSP	Italy	66	0	24	7,870
	OK1DWC	Czech.	38	0	19	7,220
	EA1AW	Spain	62	0	17	5,440
	EA5AEN	Spain	47	0	19	4,665
	CT1AFN	Portugal	47	0	17	4,250
	EA5JC	Spain	43	0	18	4,050
	EA2BUF	Spain	48	0	16	3,925
	OK2SRA	Czech.	42	0	15	3,150
	OK3CRT	Czech.	16	0	11	1,760
	Y24AK	GDR	21	0	10	1,050
	Y64YG	GDR	18	0	7	630
	SP6DVP	Poland	13	0	8	520

W/VE—Multi-Operator:

**	KM5X	TX	1,313	58	29	585,945
*	WB8IFP	OH	1,522	—	—	584,825
*	KC1U	PA	1,210	56	21	475,475
*	W0CEM	KS	1,338	59	11	453,590
*	W4SEL	KY	1,097	56	11	371,515
*	W8RA	MI	1,138	56	8	364,000
*	NK7U	OR	800	57	9	264,990
*	KC5DX	TX	751	56	13	261,510
*	N4FNB	TN	710	48	8	200,760
*	WV2ZOW	NJ	430	27	3	64,500
*	WB6EGE	CA	165	33	5	31,540
*	KB8AC	IN	140	44	1	31,500

(WB8IFB did not cite W/VE and DX multipliers separately. He had a total of 77 multipliers.)

Multi-Operator Participants:

WV2ZOW	WV2ZOW, WB2TIX
N4FNB	N4FNB, KA4IEU, KB4LXS
W4SEL	W4SEL, KI4LE, W4WYX, KF4NB, KD4TQ
KC5DX	KC5DX, NN5E
KM5X	KM5X, N5RZ, K5ZD
NK7U	NK7U, NI7T
KB8AC	KB8AC, WD8LLR
WB8IFB	WB8IFB, KC8CP, N8EZM, WA2ZQW, WD8ROD
W8RA	W8RA, NF8CM, N8CXX
W0CEM	W0CEM, WA0TKJ, AB0S, K0WA

RULES AND FORMS:

Contestants are encouraged *to send an SASE* for official forms:

Bill Gosney KE7C, World Championship Contests, 2665 North Busby Road, Oak Harbor WA 98277, USA.

Mail each entry to the appropriate contest chairman:

10-Meter Contest Chairman
Linda Ingram KG6MO
44720 N. 11th Street East
Lancaster CA 93535

15-Meter Contest Chairman
Gary Vest NW5E
Star Route, Box 34
Holliday TX 76366

20-Meter Contest Chairman
Chuck Ingram WA6R
44720 N. 11th Street East
Lancaster CA 93535

40-Meter Contest Chairman
Dennis Younker NE6I
43261 6th Street East
Lancaster CA 93535

75-Meter Contest Chairman
Ron Johnson KC7PA
68 South 300 West
Brigham City UT 84302

160-Meter Contest Chairman
Bill Gosney KE7C
2665 N. Busby Road
Oak Harbor WA 98277

WB9HAD, KM5X, and EA3CCN —160-Meter World Champions—

The 1986 single-operator champion distanced the second-place finisher by more than 300 QSOs; the multi-op competition was a barn burner. Only 1,020 points separated the champion and his runner-up. Truly exciting!

WB9HAD became World Champion in the W/VE single-operator class with 1,431 QSOs, 59 states and provinces, and 16 DX countries on 160. His only challenge came from second-place finisher W3YOZ, who tallied 1,106 QSOs, 56 states and provinces, and 18 DX countries.

For single-op DX stations, our friend EA3CCN earned this year's championship with 196 QSOs, 7 states and provinces, and 35 DX countries. Considering poor European propagation both nights, this effort is to be commended. Hopefully, conditions will be better in '87.

KM5X made its mark in the multi-operator category. This world-championship station slipped past well-known contender WB8IFP by a margin of 1,020 contest points. The big difference was in multipliers. KM5X had 87 total multipliers compared to 77 for WB8IFP. Unfortunately for the runner-up, his higher-latitude location restricted his DX capabilities. [Now you know how we feel in the Northwest! Hi!]

Becoming a 160-Meter World Champion places you in a group of some notable Top Band operators. Let's review a bit of 160-meter history:

75-METER SOAPBOX

IK4CFV —Good-bye and good job! Please send rules for next year's contest.

KY1H —Good activity. Wish I could have stayed on 24 hours instead of only six.

KQ3V —I know I passed up several multipliers who were working "straight up" in the window. I think this is one of the best contests going.

KA7STQ—At the age of 15, it's hard to stay up all night after going to school all day Friday and running the 40-meter test, too!

KC7PA —I learned not to use a new rig for the first time during a contest.

KD0OZ —Have to put up an 80-meter antenna next time. Lots of fun!

KV0I —It's rough contesting when the line noise is running 10 over S-9. I was surprised I could do as well as I did.

VE5RA —Was able to work all 50 states and all 13 provinces and territories. [Super job, OM!—KE7C]

VE7AO —Enjoyed the contest very much. Was disappointed at some of the U.S. stations operating in the DX window. Looking forward to next year.

VY1CW —Severe geomagnetic disturbances for the preceeding weekend and strong aurora during the test. At 0600 UTC the band was practically dead.

WA5IYX —Quite a few big thrills; my first KL7, European, and African QSOs on 75 meters.

Single Op	W/VE	DX
1981	W8LRL	C6ADV
1982	W9RE	VP9BO
1983	KC8JH	YV3AZC
1984	WA2SPL	EA3CCN
1985	N7DF	LZ2CJ
1986	WB9HAD	EA3CCN

Multi-Op	W/VE	DX
1981	W4CN	ZF2DX
1982	W8NGO	—
1983	K8ND	YU7JDE
1984	K9ZUH	LZ2CJ
1985	WB8IFP	G6HH
1986	KM5X	—

Were there any world records broken? Of course there were! With Big Guns leading the pack, you expect a shoot-out, right? Here's how this year's efforts fit into the record book for 160-meter QSOs:

WB8IFP	1986	1,522
WB9HAD	1986	1,431
W0CEM	1986	1,338
KM5X	1986	1,313
KC1U	1986	1,210
N7DF	1985	1,177
W0EJ	1985	1,152
N7DF	1984	1,125
W8RA	1986	1,138
W9RE	1982	1,118

Single Op:

NR5M	TX	TS-930S	Alpha 77D	2-element yagi; 3 half-wave slopers
K0HA	NE	TS-830S	HB 813s	6-element phased verticals
WB9HAD	IL	TS-930S	Alpha 374	Delta loop and beverages
N4KMY	NC	TS-430S	Clipperton	Quarter-wave slopers
N8CXX	MI	FT-102	SB-220	Inverted vee and vertical

Multi-Op:

K3TUP	PA	TS-930S	Alpha 77D	4-element vertical, dipole
W8LT	OH	TS-830S	TL-922A	600' longwire, bobtail
KS9O	IL	C-Line	SB-220	Delta loop, sloper
NK7U	OR	TS-930S	Alpha 78	Delta loop, vertical
KS3F	PA	TS-930S	Alpha 76	Inverted vee

Table 2. Antenna systems for the top-ten 75-meter stations.

Can you imagine 1,500 QSOs on 160? Now you see why our events are said to be the busiest going. There were more than 3,500 stations on the band, so you have to ask why WB8IFP didn't work the other 2,000? The obvious answer is that time ran out or he probably would have.

How did everyone else fare? Stations with 1,000 or more QSOs included: WB8IFP (1,522), WB9HAD (1,431), W0CEM (1,338), KM5X (1,313), KC1U (1,210), W8RA (1,138), W3YOZ (1,108), W4SEL (1,097), KC8P (1,050), and K3ZO (1,030).

On 160, multipliers are at a premium. Stations with 50 or more states and provinces to their credit included: K3ZO (61); KV0I (60); W0CEM and WB9HAD (59 each); KM5X (58); NK7U and K7VIC (57); KC1U, W4SEL, W8RA, KC5DX, KF4HK, W3YOZ, KC8P, and VE3NNR (56); K2RIH and VE5RA (55); W0EJ, K6HNZ, and K7QQ (54); W4MTR and N4LTA (53); VE3WR (52); WA1UJU and KA1SR (51); W4UWC, N3EHD, W9MQZ, VE4JB, and N4BSN (50).

Stations capable of DX are usually the winners. Those working 10 or more DX countries included: KM5X (29); KC1U (21); K2RIH (20); K3ZO (19); W3YOZ (18); KA1SR (17); WB9HAD (16); KC5DX and VE3NNR (13); W0CEM, W4SEL, K6HNZ, and KF4HK (11).

Speaking of statistics, one of the highlights of the year is reviewing the 160-meter honor roll. This year we see some new records broken. Look at your state, province, or DX country. Do you recognize someone's call? Why not give him a run for his money in '87? Become a regional champion—earn your place on the 160 honor roll!

The 1986 contest found stations wall to wall on the band. Who will be the first to do 2,000 QSOs on 160? K1AR, how about you? Pssst, N2AA, are you anxious to try? Is 2,000 even possible?

Overall Winners—Single Op:

USA	K4JPD	85	754,650
Canada	VE5RA	86	332,220
DX	NP4CC	85	288,090

Overall Winners—Multi-Op:

USA	K3TUP	86	733,590
Canada	VE2ZP	82	42,307
DX	IK4CFV	86	336,565

W/VE Stations—Single Op:

AL	KD4XR	82	10,912
AR	N7KA	84	121,320
AZ	KQ7Y	85	40,940
CA	NA6T	84	185,310
CO	AD0D	84	344,085
CT	W1WEF	86	220,800
DE	AC3T (KA3B)	86	60,480
FL	N4BAA	84	578,260
GA	K4JPD	85	754,650
IA	WB0NCR	83	37,332
IL	WB9HAD	86	430,400
IN	KB0C/9	85	96,050
KS	N7DF	85	596,505
KY	NA4D	84	114,900
LA	KA5VUU	86	122,200
MA	KA1XN	84	412,880
MD	K3ZO	86	170,000
ME	KN1M	84	76,850
MI	N8CXX	86	364,965
MN	KI0F	84	125,685
MO	K0CS	84	283,380
MS	AE5H	85	65,280
MT	KS7T	85	104,225
NC	N4KMY	86	396,900
ND	KI3V/0	84	161,280
NE	K0HA	86	434,350
NH	AK1A	85	239,910
NJ	N2NU	84	417,970
NM	W5TTE	84	58,395
NV	KD7SP	85	115,640
NY	KA2AEV	85	143,400
OH	KC8JH	84	273,275
OK	K2GKK/5	83	22,814
OR	KI7M	84	112,895
PA	KQ3V	86	307,380
RI	KA1SR	85	129,270
SC	K4ADI	84	78,750
TN	N4TG	85	164,430
TX	NR5M	86	594,500
UT	N7DF	82	57,642
VA	AA4UE	85	127,875
VT	KT1J	85	22,420
WA	K9JF/7	85	168,960
WI	WA1UJU	84	156,600
WV	NJ8N	86	115,130
WY	KB8KW/7	86	61,425
BC	VE7AV	86	247,160
LAB	VO2CW	83	1,320
MAN	VE4ALO	86	155,135
NB	VE1AJJ	82	10,146
NWT	VE8XO	84	2,070
NS	VE1BDT	85	43,780
ONT	VE3CYX	85	317,770
QUE	VE2YU	85	47,940
SASK	VE5RA	86	332,220
YUK	VY1CW	86	6,405

W/VE Stations—Multi-Op:

AR	WA5VVT	85	181,760
CA	KG6MO	86	56,100
CO	KY0S	85	364,420
FL	N4BAA	82	36,480
ID	W7UQ	86	30,450
IL	KS9O	86	391,460
IN	N4FKF	84	95,175
KY	NO4R	85	369,375
LA	KD5RW	86	58,575
MA	AJ1E	84	21,033
MI	KM8U	84	220,852
MN	KD0OZ	86	79,560
MO	WB0TCF	84	4,366
NC	NW4B	84	259,600
NH	K1WW	84	380,730
NY	KF2X	84	25,488
OH	W8LT	85	530,380
OR	NK7U	86	333,640
PA	K3TUP	86	733,590
RI	KK1B	84	82,650
TN	N4JII	84	42,640
TX	K5MR	86	295,800
VA	NA4L	84	365,805
VT	WB1GMH	84	11,656
WI	W9WI	85	400,520
QUE	VE2ZP	82	42,387

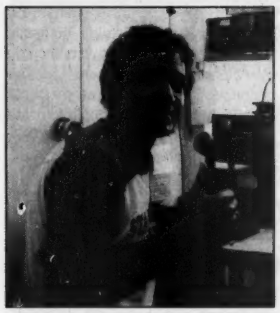
DX Stations—Single Op:

Alaska	KL7U	86	65,265
Australia	VK6DU	85	99,550
Bahamas	C6ADV	83	32,550
Barbados	8P6KX	82	4,452
Bulgaria	LZ1KOZ	85	1,210
Cayman Is.	ZF2DX	82	12,282
Czech.	OK1MSM	82	16,640
Denmark	OZ1DPW	86	2,175
Dom. Rep.	HI8GB	83	75,330
Equador	HC1OT	85	34,500
England	G5EBA	82	868
Finland	OH1RY	85	189,150
France	F8WE	83	1,794
Greenland	OX3ZM	82	10,810
Guam	KD7P/KH2	84	48,800
Honduras	HR1FC	85	31,200
Hungary	HA8IE	83	1,938
Italy	I3MAU	82	96,334
ITU/Geneva	4U1ITU	84	41,125
Japan	JF2DQJ	85	12,960
Monserratt	K3WGR/VP2M	85	94,855
Morocco	CN8CO	82	67,032
Netherlands	PA3AZM	82	360
New Zealand	ZL1BQD	84	137,625
Portugal	CT4NH	82	10,770
Puerto Rico	NP4CC	85	288,090
Romania	YO4BXX	82	369
Soloman	H44SH	82	5,568
Spain	EA3CCN	84	71,815
Sweden	SM4CAN	82	1,250
Venezuela	YV5BHW	86	212,055
W. Germany	DF9ZB	85	123,240
Yugoslavia	YU3PG	85	1,850

DX Stations—Multi-Op:

Columbia	HK1SC	86	172,975
Czech.	OK3KFF	85	18,900
Italy	IK4CFV	86	336,565
Japan	JA2YKA	86	38,775

Table 3. 75-meter honor roll—all-time record holders. (Columns show QTH, callsign, year, and score, respectively.)



YV5BHW, the 75-meter single-op DX champion.

IK4CFV, the 75-meter multi-op DX champion.

NR5M, K3TUP, IK4CFV, and YV5BHW —75-Meter World Champions—

The dust has settled and the entries are in. George NR5M and John K3TUP are the undisputed World Champions for 75-meter phone. Attaining nearly 1,100 QSOs, their multiplier counts were their trump cards, each surpassing their second-place rivals by 17 DX countries! NR5M, a single-op station, earned 1,087 QSOs, 58 states and provinces, and 42 DX countries. K3TUP made 1,097 contacts, 59 states and provinces, and confirmed 55 DX countries. By the way, this is John's second 75-meter Championship in a row. He is also 3-time World Champion on 40 meters. Awesome! It's obvious who the competition is. Congratulations, fellas!

Gustavo YV5BHW took first place to become World Champion for single-operator DX stations. In the multi-operator category, IK4CFV dominated the band by outscoring second-place station HK1SC nearly two to one. You both did a great job. Hats off to these World Champions!

Did we see the world QSO record broken? No, not this time, but we did see a few slots in the top ten list changing hands from last year:

Single Op:

N7DF	1985	1,265
K4JPD	1985	1,153
NR5M	1986	1,087
N7DF	1984	1,076
WB9HAD	1986	1,053
K0HA	1986	985
N4BAA	1984	894
N0XA	1985	888
N4KMY	1986	822
N8CXX	1986	804

Multi-Op:

K3TUP	1985	1,180
W8LT	1985	1,120
K3TUP	1986	1,097
W9WI	1985	1,025
NO4R	1985	964
KY0S	1985	892
W8LT	1986	876
KS3F	1986	837
KS9O	1986	808
NK7U	1986	800

75-METER WORLD SSB CHAMPIONSHIP CONTEST

Callsign, QTH, QSOs, states and provinces, DX countries, total score
** = World Champions; * = State, Provincial, or DX Country Champions

W/VE—Single Operator:

**	NR5M	TX	1,087	58	42	594,500
*	K0HA	NE	985	60	25	434,350
*	WB9HAD	IL	1,053	58	22	430,400
*	N4KMY	NC	822	59	31	396,900
*	N8CXX	MI	804	60	27	364,965
*	VE5RA	SASK	760	61	23	332,220
*	KQ3V	PA	600	58	36	307,380
*	VE7AV	BC	653	57	17	247,160
*	W1WEF	CT	529	52	23	220,800
	KB3A	PA	472	56	21	192,885
	KC8P	MI	475	57	18	187,125
*	K3ZO	MD	352	52	28	170,000
	K8HVT	CT	415	56	18	159,840
*	VE4ALO	MAN	433	59	12	155,135
*	KN1M	ME	351	52	22	141,340
*	WA1UJU	WI	430	53	5	125,280
*	KA5VUU	LA	368	54	11	122,200
*	W4WKQ	FL	402	54	5	118,590
*	NJ8N	WV	409	47	9	115,136
*	K7LXC	WA	305	52	14	108,570
*	KY1H	MA	330	51	7	98,310
*	KA1SR	RI	237	50	11	75,335
*	WA6FGV	CA	245	52	5	71,535
*	KB8KW/7	WY	180	53	10	61,425
*	AC3T (KA3B op)	DE	177	48	15	60,480
	W3ARK	PA	244	46	3	60,025
	W7STQ	WA	136	44	8	38,740
*	AI9X	NM	155	40	5	35,775
	VE7AO	BC	117	48	7	35,475
*	KA7STQ	OR	156	39	1	31,200
	W8VEN	WV	114	43	9	30,940
	KD5SA	TX	124	44	3	29,845
	KF4HK	NC	106	38	11	25,970
	KF1R	CT	105	41	4	24,075
	K1SSN (K1AME op)	CT	100	38	4	21,840
	WK4F	FL	96	38	6	21,780
	WA5IYX	TX	84	37	8	20,025
	K8KUH	MI	87	35	1	15,840
	K4GKV	GA	68	32	1	11,385
	W3RGX	MD	58	33	2	11,025
	W9REC	IL	60	35	1	10,980
	N5AFV	TX	60	32	0	9,600
	NC9F	IL	50	27	0	6,750
	VY1CW	YUK	61	19	2	6,405
	KA9LWL	IN	39	28	0	5,460
	K2SCU/5	TX	42	22	3	5,250
	W0NGB	MN	40	26	0	5,070
	WE6G	CA	33	16	2	2,640
	W3FQE	MD	7	5	0	175
	WA3JXW	PA	5	4	0	100

DX—Single Operator:

**	YV5BHW	Venezuela	320	49	8	212,055
*	KL7U	Alaska	204	43	14	65,265
	JH1DHI	Japan	50	15	7	10,780
	EA3BOX	Spain	50	6	17	7,705
	CT1TM	Portugal	21	10	7	3,060
	OZ1DPW	Denmark	25	3	12	2,175

W/VE—Multi-Operator:

**	K3TUP	PA	1,097	59	55	733,590
*	W8LT	OH	876	58	38	453,120
*	KS9O	IL	808	58	34	391,460
*	NK7U	OR	800	56	19	333,640
*	KS3F	PA	837	57	17	315,240
*	K5MR	TX	639	58	31	295,800
*	W4TMR	NC	354	52	10	111,290
*	KD0OZ	MN	305	51	1	79,560
*	KD5RW	LA	210	48	7	58,575
*	KG6MO	CA	196	49	6	56,100
*	W7UQ	ID	143	38	4	30,450

DX—Multi-Operator:

**	IK4CFV	Italy	520	43	40	336,565
*	HK1SC	Columbia	318	47	8	172,975
*	JA2YKA	Japan	121	14	19	38,775
	JA9YBA	Japan	49	8	11	9,120

(Checklogs—By request: EA3CTI, EA3PE, KJ4NC, OZ1DPW, VO1OP; checklogs—Late entries: 4Z4TR, AH6EK, DL6FBL, JA1YAG, JA7YCQ, K5GN, OH7EU.)

Multi-Operator Participants:

HK1SC	HK1JWH, HK1JXV
IK4CFV	I4JMY, I4YSS, IK4BPE, I4USC
JA2YKA	JF2DQJ, JG2MTC, JG2VTD, JG3OET
JA9YBA	JH7UJR, JA9VDA
K3TUP	K3TUP, KB8IZ, KJ3L, N3BJ, AI8S
K5MR	K5MR, N5RZ
KS3F	KS3F, WA3SPJ
KD5RW	?????
KG6MO	KG6MO, WA6R
KS9O	KS9O, NB9T, KA9DVY
KD0OZ	KD0OZ, KA0UPF
NK7U	NK7U, NI7T
W4TMR	W4TMR and XYL
W7UQ	WL7AFB, KA7KGF
W8LT	K3JT, NZ4K, KU8E, KD8NS

Speaking of records, gander at the 75-meter Honor Roll list. We saw some new calls breaking or establishing records. Gives you an incentive to turn out for next year's contest, doesn't it?

For a 24-hour contest, especially on 75-meters, can you imagine making all those contacts? Insomnia? Wonder how many stations slept through the day Sunday?

Stations with 500 contacts or more included: K3TUP (1,097), NR5M (1,087), WB9HAD (1,053), W8LT (876), KS3F (837), N4KMY (822), KS9O (808), N8CXX (804), NK7U (800), VE5RA (760), VE7AV (653), K5MR (639), KQ3V (600), W1WEF (529), and IK4CFV (520).

In the past, Canadian multipliers have been a holdout. This year all states and provinces (48 states and 13 provinces) were heard and worked on the band. Turning in totals of 50 or more W/VE multipliers were: VE5RA (61); K0HA and N8CXX (60); K3TUP, N4KMY, and VE4ALO (59); NR5M, W8LT, KS9O, WB9HAD, and KQ3V (58); KS3F, VE7AV, and KC8P (57); NK7U, K5MR, KB3A, and K8HVT (56); KA5VUU and W4WKQ (54); WA1UJU and KB8KW/7 (53); W4TMR, W1WEF, K3ZO, KN1M, K7LXC, and WA6FGV (52); KD0OZ and KY1H (51); KA1SR (50).

The DX country count was very good for 75! Of course, the East Coast stations had a sizable turnout of European stations while the West Coast had very slim pickings from Asia and the South Pacific. Stations achieving 25 or more DX countries include: K3TUP (55), NR5M (42), IK4CFV (40), W8LT (38), KS9O (34), K5MR (31), K3ZO (28), N8CXX (27), and K0HA (25). On the West Coast, NK7U had the most DX countries worked with 19, followed by VE7AV with 17; K7LXC and KL7U confirmed 14.

75 meters and 160 are the two bands most vulnerable to high noise levels. Being able to receive a station is much tougher than trying to be heard. The hunk of wire you put up, its height above ground, the direction it is strung; with verticals, how it is fed, how it is cut (wavelength), whether it has radials or not, all are determining factors that must be considered if you expect to be a championship station on this band. So what attempts are made by our participants? From the results, here's what the breakdown looks like, showing the antennas used in the 75-meter contest and their percentages:

Inverted vee/dipole	40.0
Vertical	16.3
Quarter-wave sloper	8.7
Delta loop	7.6
Phased verticals	6.2
Inverted "L"	5.0
Half-wave sloper	5.0
Longwire	3.7
Wire beam	2.5
Bobtail curtain	2.0
Zepp	1.2
2-element yagi	1.0
3-element yagi	.8

Table 2 takes you a step further and shows you how all these statistics equate to what the top-ten stations were actually using on the air.

As we get ready for the 1987 contest season, all stations are reminded to observe the DX window from 3.790 to 3.805. For contest purposes, *the contest rules state that the DX window is for split-frequency operation only!* This means DX stations will only transmit and W/VE stations will only listen in the DX window. Two-way exchanges within the window, regardless of whether you are DX or W/VE, will result in your entry being disqualified. Unfortunately, this year a few stations were victims of this stipulation. We regret this action, but the integrity of our Championship events requires we not deviate one iota from the rules. Using the DX window as it was intended will mean more DX for us all!

Ron Johnson KC7PA, our 75-meter Contest Chairman, and I thank you for your participation. The season has been exciting. Congratulations to our state, provincial, and DX country winners. See you all this coming January. ■

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144 MHz	13 El Portable	14'6"	14.0	78.00
144 MHz	17 Element	21'6"	15.2	119.0
435 MHz	9 Element	4'1"	13.0	59.00
435 MHz	19 Element	9'3"	16.2	68.00
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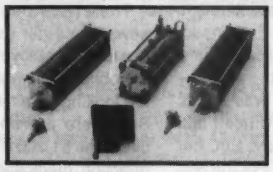

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OUR CHRISTMAS STORY

Sometimes a writer must search long and hard for a story to fit the holiday season. The easy way out is to simply report on all the new gear to be found "under the tree." That is, if your Christmas tree happens to be over the operating position in your ham shack. But, there is a lot more to the holiday season than a new hand-held or an HF transceiver. The holiday season is really a time for a new beginning. At least it's been that way in my life, and I'll bet it's been that way for many of you as well. So, keeping this concept in mind, I began searching for something apropos. As it happened, the material I was looking for had been right under my very nose since late last summer. It comes from the well-respected Southeastern Repeater Association's *Repeater Journal*, and was originally authored by Wayne C. Williams K4MOB. I have taken some slight liberties in revising the text to fit the national/international format of *73*, but I hope that you will feel as moved when you read it as I did. Here now is *73* Magazine's "Christmas Story."

A Portrait of Petie

The Sunday morning Radford, Virginia, *News-Journal* had the big headline: "PETIE AWAKE—SMILING AND WANTING A COKE." For those who had been following the life drama of Michelle "Petie" Lineberry, this was wonderful news.

Petie had just received a new heart from an unidentified Dallas, Texas, donor. The transplant operation had begun at 6:15 a.m. on Friday, June 13. Now, on Sunday, she was doing "very well" in the cardiac intensive care unit at the Medical College of Virginia.

Petie is the 20-year-old daughter of Bill Lineberry WB4TGT of Radford. Her problems began about two years ago when she visited the doctor because of a stubborn chest cold. They found a murmur in her heart. A year later, another visit determined that her heart was beating in an erratic pattern and fluid was building up in her lungs. At the Medical College of Virginia, they found that one side of her heart was completely dead. The muscles were not pumping, just wiggling.

Despite this, Petie went back to Radford University and maintained a B average, finishing the spring semester. Her condition continued to deteriorate, and she was admitted to the hospital in Radford, and then transferred to MCV. The prognosis: Petie needed a new heart. The search for a suitable donor started.

In June the donor was found; Petie received her new heart and is still recovering nicely. But, her troubles are not over. For the rest of her life, Michelle will be saddled with a $1,200-per-month anti-rejection medication bill. Unfortunately, WB4TGT had been laid off by AT&T just prior to Petie's operation, and hospitalization insurance was lost. Bills from the operation have exceeded $100,000 and, as already noted, will continue to build at a clip of $1,200 a month.

To try to help Petie and her family cope with these monumental expenses, a committee was established by interested friends in Radford. It's called the "Chance for Life Committee," and it has been conducting all sorts of fund-raising events in the town to help out. Due to the enormous amount of money that needs to be collected, help is being sought from every possible source.

Enter Ham Radio

Bob Cecil WA4LNT has now started a campaign through amateur radio to help out his friend and fellow amateur WB4TGT and Petie. He asks that any or all hams nationwide who would like to help out to contact him. In addition, donations can be sent to Bob and he will forward them to the "Chance for Life Committee" on behalf of the amateur radio service. Clubs, repeater groups, and hamfest chairmen are also urged to find ways to join this drive to collect funds for this worthy cause.

In preparing this holiday column, I called Bob on October 11 to get an update on how Petie and her dad were doing. In one of those truly rare quirks of fate, at the time the phone rang at Bob's house, he was on the air and in QSO with Bill Lineberry WB4TGT. Only a few moments earlier, Bob had spoken with Petie and had learned that the doctors handling her case were amazed at the recovery. Right now, those very expensive anti-rejection drugs are doing their intended job and as a result, Petie is not only back in school, but she is also into a teaching work program where she holds classes twice a week—one day on the University campus and another at an outside grade school. She is majoring in child psychology, and doing quite well with her studies.

There has been some good news about her dad as well. Bill has found employment with an automobile dealership, and things are looking up a bit for the family. But, there are still the medical bills—the $1,200 a month for anti-rejection medication that will be with Petie for the rest of her life.

"The $1,200 a month for anti-rejection medication will be with Petie for the rest of her life."

As I write this, a thought occurs to me. There are currently about 450,000 licensed amateurs in the United States. If each one of us gave Petie's "Chance for Life Committee" a one-dollar donation, that would bring in close to a half-million. It could also mean that Petie need never again worry about the costs related to her illness.

Heart disease is a very expensive illness to suffer from. I know this firsthand, since I too am afflicted by it. Less than two years ago, I was a candidate for bypass surgery, but a new miracle drug has at least temporarily brought my problem under control. Obviously, I am far luckier than Michelle "Petie" Lineberry, but I too pay a high price—both financially and psychologically.

So, how about it, guys and gals? We pride ourselves on our dedication to public service. What better service can we hams collectively perform than to help to insure a life? How about we amateurs putting our monies where our mouths usually are, and collectively adopting Petie and her problems as a symbol of the one-on-one public service aspect of what ham radio is really all about? My few bucks are already in the mail. How about yours? Donations should be sent to the "Chance for Life Committee," c/o Bob Cecil WA4LNT, New River Valley Amateur Radio Club, Inc., Drawer 1127, Dublin VA 24084. No pun intended, but this is a topic that is personally very close to my heart.

HAM RADIO GIFT TAPES

I cannot close this month's column without making reference to one of the few tangible holiday gifts "that keeps on giving." Videotapes. You do not have to be a ham to enjoy them, but you do need to own a VCR. Beta or VHS. First, a presentation from one of the major studios. More accurately, you might say that it's a gift from a ham radio operator to the world, although you will have to pay to get a copy. The ham I am writing about is Jean Shepherd K2ORS. I first met Jean when he was still doing his late-night talk program on WOR radio in New York. Unlike the phone-in programs of today, "Shep" relied on his own abilities as an "observer of our times" to keep an audience "glued to its Emerson" for hours. Jean is the only radio host I know of who could make you enjoy listening to a commercial! After his WOR show, he could be found driving home and chatting with our "gang" on the old WA2SUR repeater.

In the 1970s, K2ORS hosted a little-known ARRL "video" titled "OSCAR And The Ham." I am still unsure of who produced and directed it, but it did explain the ways in which the second generation of OSCAR satellites could be used as an educational tool. Why the ARRL never exploited it the way they did films like "Hams' Wide World" or "Moving Up To Amateur Radio" is something I'll never understand. Maybe it was because "OSCAR And The Ham" was done on the then-new medium of videotape, and tape was something with which the ARRL was unfamiliar.

Jean has also been the featured banquet speaker three times at the Dayton Hamvention, and in 1985 I was able to corner him to record some public-service spots about ham radio. We did them on videotape, but at the time we had no way of knowing that the camera had malfunctioned. Since the audio was unaffected, they were

converted to radio spots by Lenore Jensen W6NAZ and sent off to ARRL HQ for distribution.

Anyhow, a few years back, Jean grabbed a jet out here to Hollywood, and with the folks at MGM/United Artists, he created the modern "Christmas Folk-tale." It has the simple but very apropos title of "A Christmas Story" and is based on his earlier best-selling book titled *In God We Trust—All Others Pay Cash.* If you have seen the film, then you already know what I mean. If not, go out and treat the family to something very special. It's a tape you will want in your collection, and an experience that will last a lifetime. Try any good video store to purchase a copy.

Another tape that you might want to have in your collection is "SAREX—The Shuttle Amateur Radio Experiment." Not because it tells the story of manned ham radio and ham TV in space, but rather as a lasting tribute to a truly valiant space machine that was known as the *Challenger.* The second amateur radio space operation flew on the *Challenger* in July of 1985. *Challenger* had only one other successful launch—Flight 61-A—before the accident that caused its destruction and the loss of its seven-person crew earlier this year. But the 61-A flight was never chronicled in as public and in-depth a way as was the "Ham in Space" 51-F mission. So, in essence, Roy Neal's ARRL video "SAREX—The Shuttle Amateur Radio Experiment" stands as a lasting and living testimonial to a truly proud space machine and to the many men and women who flew on her. You can purchase a copy on VHS for $25 from the ARRL, 225 Main Street, Newington CT 06111. They do not supply it in Beta format, but as one of its producers, I have a dub-master and will gladly fill any Beta II or Beta III orders as a not-for-profit service for the same price.

I wish you all the best of Seasons Greetings from those of us who write the late shift, here in the City of Angels. ■

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WEATHERSAT

Number 26 on your Feedback card

Dr. Ralph E. Taggart WB8DQT
602 S. Jefferson
Mason MI 48854

VIDEO FORMATS

This month I am going to take a look at the basics of weather satellite video formats. One of the things that greatly simplifies the design of a weather satellite station is that all direct-broadcast satellites, be they polar orbiters or geostationary spacecraft, employ the same basic video modulation format. Although the rf modulation of these satellites is FM, the actual video signal transmitted in this fashion is an AM-modulated audio tone. The audio tone or subcarrier is typically 2,400 Hz or something very close to that value, a subject I will return to briefly at the end of this discussion. The modulation "sense" is such that minimum subcarrier amplitude corresponds to black, while maximum amplitude represents white.

Fig. 1 shows a diagram representing the detected and filtered subcarrier during one line of transmission of a hypothetical 16-step grayscale. The grayscale begins with black on the left and ends with white on the right side of the display. The white level (100% amplitude) is arbitrarily set at +5 V. Note that the black step is *not* 0 V (no subcarrier). With most spacecraft, assuming the modulator is operating properly (see discussion later), the black level will be about 4% of the peak white level or about 0.2 V with a +5-V peak white value.

The dynamic range of this signal, measured from 4% black to 100% white, is thus about 26 dB. This implies that the signal-to-noise ratio should be at least 26 dB, and preferably a little more, in order to have a "noise-free" video signal. As the amplitude of the noise increases relative to the video signal, the effect will first be noted as "snow" in the black end of the dynamic range. As noise levels increase, you will eventually reach a point where only the whitest portions of the image will peak above the noise threshold. There are two principal ways to increase the signal-to-noise ratio and lessen the impact of noise on your final display. The first involves optimizing the rf end of the system in several ways:

1) Maximizing antenna gain. Ignoring the negligible impact of solar and galactic noise, increasing the gain of the antenna provides basically "noise-free" gain.

2) Use of a low-noise front end.

3) Matching the i-f bandwidth to the signal bandwidth, a subject I discussed last time.

Assuming you have done everything possible at the rf end, some judicious audio filtering can be applied to reduce the impact of noise falling outside of the 2,400-Hz video passband. This is more complicated than simply putting a sharp 2,400-Hz bandpass filter in the video line because the AM-modulated 2,400-Hz tone has sidebands just like any AM signal and these must be passed in order to recover the video modulation with minimum distortion. Relatively low Q active filters, centered on 2,400 Hz with a bandwidth of about 1,600 Hz, work well in practice.

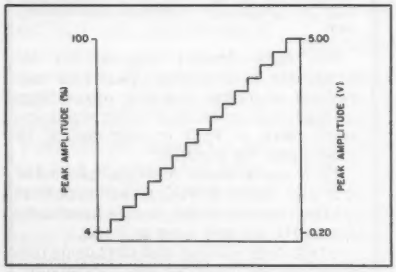

Fig. 1. Diagrammatic representation of a detected and filtered subcarrier signal modulated by a 16-step grayscale. The grayscale steps run from black on the extreme left to white on the extreme right. Output amplitude has been arbitrarily scaled to +5-V maximum. Note that while white represents maximum subcarrier amplitude (100% per 5 V), black, while minimum, does not go to zero. Black is normally about 4% of peak amplitude, corresponding to 0.2 V on the scale above.

Basic Signal Conditioning

Your basic weather satellite video system involves a video detector and post-detection filter to recover the modulated waveform in a form similar to that illustrated in Fig. 1. The filtered video output voltage is then used to control the display in one of three general ways:

1) Modulate the intensity of a CRT scanning beam in the case of a CRT (cathode ray tube monitor).

2) Control of the voltage on a printing stylus or the intensity of a glow modulator tube for facsimile printing.

3) A/D (analog-to-digital) conversion of the detected waveform for scan converter display.

Regardless of how we are going to use the video, it is obvious that an AM system of this sort is going to be amplitude sensitive. Any display system will require some sort of gain or contrast control so that the peak subcarrier amplitudes will reproduce as white while the minimum (4%) amplitude will come out black. Anything that changes the peak white amplitude in your system will result in a need to readjust such a control. Such readjustment can be tedious unless you use a scope to look at the video waveform, so we would like to minimize such peak amplitude variations as much as possible.

Unfortunately, there are lots of links in the system where such variation can occur. One of the more obvious sources, if you are recording pictures with tape, is variation in recording levels and audio output levels from your tape deck. This problem can be minimized by using a constant record and output level setting, preferably a combination that results in the same peak level that you would normally get directly from your receiver.

A second source of amplitude variation comes from the receiver in ways that are not inherently obvious. At this point, those of you who read my last column may be mumbling because I showed you how to install a constant output video tap from the top of the volume control. If we assume a constant gain from the rf, i-f, and audio stages, such a tap will always produce the same peak audio level at the output, given the *same* input signal. Unfortunately, even though the gain characteristics of your receiver may be quite stable, satellite input signals are rarely "the same," primarily due to differences in the deviation of the spacecraft transmitters.

Assuming your discriminator is reasonably linear, if your receiver will generate a peak output level of 1 V (a purely arbitrary value) with a fully modulated TIROS/NOAA signal deviating ±18 kHz, what do you think the results will be on a WEFAX geostationary signal that may be deviating ±10 kHz? The answer is about 0.55 V—10/18 x 1! If your display system is adjusted to display peak white with the NOAA signal, your WEFAX image "whites" will reach only mid-range gray values unless you increase the gain or contrast in the display system.

While any given type of polar-orbit spacecraft will usually be fairly similar in terms of signal deviation characteristics (similar, but not absolutely equal!), the peak signal levels recovered from the TIROS/NOAA satellites will be different from those recovered from a specific type of Soviet METEOR spacecraft, which in turn may differ from other experimental METEOR or COSMOS satel-

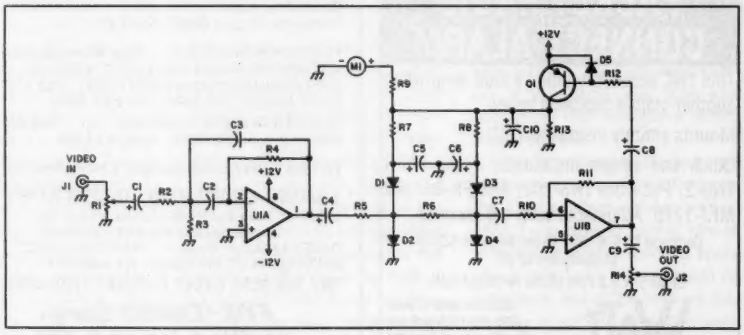

Fig. 2. Schematic of the satellite video pre-filter and agc unit. Parts values are provided in Table 1.

U1	MC1458 dual op amp
Q1	2N4403 (general-purpose PNP audio)
D1–D5	1N914 or other general-purpose diode

Resistors: Unless otherwise noted, all values are in Ohms; everything except the pots are 1/4-W, 5%, metal film or composition.

R1	10k PC pot (AGC THRESHOLD)
R2, R7, R8	10k
R3	2700
R4	20k
R5, R6	4700
R9, R13	47k
R10	1000
R11, R12	120k
R14	10k PC pot (GAIN)

Capacitors: Unless otherwise noted, all values are in uF: M = mylar (100 V), T = tantalum electrolytic (16 V min.), A = aluminum electrolytic (16 V), and D = disc ceramic (50 V).

C1, C4, C8, C9	1 T
C2, C3, C7	0.01 M
C5, C6	22 T (6 V)
C10	100 A
C11, C12	0.1 D
J1, J2	RCA phono jack
M1	50-microamp panel meter (agc), available from Radio Shack

Table 1. Video filter/agc parts.

Date	01 December 1986	
Spacecraft	NOAA-9	NOAA-10
Orbit Number	10137	1058
Eq. Crossing Time (UTC)	0045.67	0125.43
Longitude Asc. Node (Deg. W.)	148.55	88.87
Nodal Period (Min.)	102.0638	101.2979
Frequency (MHz)	137.62	137.50

These orbital parameters are projected two months in advance due to deadline considerations. Accumulated errors due to uncompensated orbital decay and other anomalies result in expectation of errors up to two minutes and possibly as many degrees in terms of the crossing data and possible small changes in the indicated period. Users requiring precision tracking data should rely on more current sources.

Table 2. TIROS/NOAA orbital predict data.

lites. WEFAX deviation levels can differ significantly, even from the same spacecraft, since the output signal on the WEFAX downlink simply mirrors the uplink signal, which is subject to both ground equipment and operator foibles.

Most of this unavoidable variation can be minimized in any display system by the addition of automatic gain control (agc) prior to video processing. Fig. 2 shows a simple front-end circuit to accomplish this with the added bonus of pre-filtering of the video signal.

U1A is one section of a dual op amp wired as an active audio bandpass filter. The circuit has unity gain, a center frequency of 2,400 Hz, and a bandwidth of approximately 1,600 Hz. Placing this filter at the input of the circuit module provides two functions. The first is the obvious one of minimizing the effect on the display of noise outside of the video passband.

The second function is to minimize the effect of noise on the agc section that follows. The output of U1A is routed through a two-stage diode attenuator consisting of four 1N914 diodes (almost any diodes will do as long as they are all the same type). The attenuation level in this network is directly proportional to the dc control voltage applied to the two 10k resistors, a subject I will return to momentarily. The output from the diode attenuator network is applied to the input of U1B, an op amp with a fixed voltage gain of about 120. The output of this amplifier drives a PNP transistor, which functions as the agc detector, producing a control voltage on the collector.

Relatively high drive from U1B will produce a higher control voltage on the collector than a low-drive condition will. This control voltage, when applied to the diode attenuator network through the two 10k resistors, effectively controls the attenuation level of the network that provides the drive to U1B.

Should the input peak signal level increase, the output from U1B will increase, causing an increase in the control voltage at the collector of Q1, and this will cause an increase in the attenuation of the diode array, reducing the output from U1B! Similarly, if the peak amplitude at the input decreases, the output from U1B will fall, reducing the agc control voltage, which in turn reduces the diode attenuation, causing the output of U1B to increase.

In effect, the peak output from U1B, which provides the drive for your display system, is in dynamic equilibrium, maintaining a very constant peak output level despite variations in peak input level. The input RC network to Q1 controls the attack time of the agc system (essentially fast), while the components in the collector of Q1 set the decay time constant (relatively slow). The values shown provide effective agc action without "pumping" in response to the video modulation waveform. M1 is a 50-microamp panel meter that monitors the agc control voltage and provides a visual indication that you are within the linear agc control range.

Construction

Construction of the pre-filter/agc module is quite straightforward and can be done using perfboard. Common sense dictates a reasonably compact layout, particularly around the diode network and the agc amp. I don't know what the "outer limits" are in this regard, but I have duplicated the circuit many times with no problems.

Only a few things are critical enough to triple-check! The first of these is the polarity of the agc diodes. The second concerns the basing of Q1. Note that this is a PNP device and the emitter *must* go to +12 V. Put it in backwards or use an NPN unit and you will have problems. The final point concerns the tantalum capacitor in the base lead to Q1. Note that drive is applied to the negative lead of the cap with the positive lead going to Q1. You must observe this orientation or the circuit will not work!

Setup

Preset R1 (AGC THRESHOLD) and R14 (GAIN) so that the center arm of both pots is at ground (minimum gain). Connect the output of the receiver to J1 and set the receiver to an unused channel so that the unit is driven by noise. When you apply power, the agc meter (M1) should bounce up to full scale and then slowly decline to zero. If the unit pegs at 50 microamps, turn off power and check the installation of C8, Q1, and D5.

Slowly advance R1 until the agc meter indicates a reading of 15. At this point, the GAIN control should be adjusted to the desired output level. An audio amplifier, connected at J2, should yield an undistorted version of the original signal. The best way to check this is with a modulated satellite signal. With a modulated signal at the input, the agc meter should read about 15—retrim R1 if this is not the case.

Use

In use, the module is simply placed between your video source (receiver, tape, etc.) and your normal display system. All of your sources should produce an agc meter reading of between 10 and 20, indicating the linear portion of the agc range. It is best to set the AGC THRESHOLD control as indicated and then adjust the gain of other sources so that they fall into the 10–20 range. Output gain can be set to any convenient value to drive your display. The most convenient level, assuming you have already optimized your display contrast, is a peak level that corresponds to what you used to get directly from the receiver. Not only will this module provide desirable filtering, it will also virtually eliminate knob twiddling when switching from one spacecraft or video source to another!

Subcarrier Frequency

I have previously noted that the video subcarrier frequency is at or close to 2,400 Hz. In the case of all

U.S. spacecraft, the frequency is precisely 2,400 Hz and the subcarrier signal can serve as a frequency reference for the display timebase. *Some* Soviet spacecraft have their subcarriers precisely locked, but most operational 120-line/minute METEOR spacecraft do not.

In general, it is probably not desirable to lock your display to the subcarrier as a frequency reference. The only advantage to this technique is that it makes possible the use of a monaural tape system for recording. On the minus side, the technique does not work with all Soviet spacecraft, it is subject to loss of frequency lock with signal fades, and, finally, it is not as versatile a timebase standard as we really want! If we go to an external timebase, we must use a stereo tape system for recording, but this is a small price to pay for the versatility we will get by going that route.

Earlier I made reference to the fact that the "normal" black level is about 4% of peak subcarrier amplitude. In some cases, ground equipment problems will result in a condition where WEFAX signals will go to 0% amplitude on black. This loss of subcarrier can disrupt the phase-lock time base, causing a progressive loss of image sync. A similar condition occurs during severe storm operations where the high-resolution VISSR signal is transmitted along with the WEFAX signal, causing repetitive dropouts that will cause a loss of subcarrier sync-lock. Thus, although the WEFAX S-band signal would appear ideal for a subcarrier-locked sync system, since fading does not occur, even this format has problems that limit the usefulness of locking to the subcarrier.

Photo A. An early winter storm in the process of burying the Great Lakes area. The image was obtained from an afternoon TIROS/NOAA pass in visible light.

Picture of the Month

This particular picture is quite seasonal in that it shows an early winter storm in the process of burying the Great Lakes area. The image was obtained from an afternoon TIROS/NOAA pass in visible light. The pass was automatically recorded using the "Zapper" omnidirectional antenna from the *WSH*. Lake Winnipeg shows through a bit of noise at the top, just left of center, while James Bay and a bit of Hudson Bay are visible just to the right of top center. All of these bodies of water, and most of Lake Superior, visible just above the center of the image, are ice-covered, but the lower Great Lakes, of which a bit of Lake Michigan and Lake Huron are visible, are still ice-free. Two fronts are stacked along the Appalachians in the lower right. Visible in the original, but probably missing in this reproduction, is a bit of the Mississippi River system slightly to the left of center along the bottom of the picture. The picture was printed on the direct-printing FAX recorder described in the *WSH*.

Note

References to the *WSH* refer to the Third Edition of the *Weather Satellite Handbook*, available from the author for $12.50 postpaid in the U.S. and Canada and $14 elsewhere.

Next Time

In my next column, I will look at the various sorts of timebases that are required for a satellite station.■

ATV

Number 13 on your Feedback card

Mike Stone WB8QCD
804 Jefferson Avenue
Lowden IA 52255

Direct reader response mail to my home address has been very good, indicating that there is a lot of new (and old) interest in the ATV modes. I will try to answer as much mail as possible. Always include an SASE with any correspondence. Most of your mail is asking: "Is there any UHF FSTV activity in my area?" and "What is the best equipment to build or buy?" and "How strong is color SSTV on the bands today?"

I have prepared a special informational packet of material that includes all 1986 USATVS State Section Manager listings and filed activity reports. This covers about 70–80% of the country and gives callsigns and names of ATV groups that will answer a lot of your questions and tell you who might be nearby to help you get started. To obtain this report packet, send me an SASE with an extra 22-cent stamp on it. Mark "USATVS 1986 Report Packet" clearly on the outside of the envelope.

Before I get technical in this month's column, I'd like to ask a simple favor of you all. Many of you old-timers on ATV (FSTV and SSTV) have been complaining about "lack of coverage" by some of the leading national amateur radio magazines. W2NSD/1 and KW1O have now given us this great opportunity via this column! A regular monthly column on this mode is a service to those who have not yet tried out the FUN of ham television. *We need to receive your responses!* Please take a few moments to fill out the Feedback response postcards in each issue. Let *73* know that you are indeed reading this column with great interest, and tell them what your favorite articles and columns are each month, so they will continue for a long time!

FSTV Possibilities

What types of TV pictures are transmitted by fast-scanners? Is the sending of commercial movies legal? Does sound accompany the picture as on commercial TV?

Perhaps the most common and enjoyable TV pictures sent on UHF ATV are from one-on-one QSOs in the shack. There is your ATV friend—across town, a few cities away, or maybe over a distance of several hundred miles out of state—sitting in front of the camera, looking right into your eyes, and "talking" with you! "Here's the latest circuit board I am building, John," says an ATVer as he does a zoomed close-up of the device. "Here come the XYL and the kids and they have taught Rover a new trick tonight to show you. Stand by!"

Many times, with the popularity of VCRs, home movies are sent. Other possibilities include vacations, Field Days or special events, lectures and talks, DX band-opening accomplishments, on-the-air tests, parades, air shows, and so on—the field is unlimited. No, commercial movies are illegal to send over ATV, so file that copy of "Star Wars" away for another galaxy.

Sound does indeed accompany the video picture, and there are a number of ways to send it. I will get into that in a future column.

The uses of ATV are many. Our ATV group has put a man in a hot-air balloon and sent him aloft for great ATV pictures, set up two separate FSTV-transmitting stations on the rooftops of college buildings to give go-cart race coverage of hidden (potential trouble)

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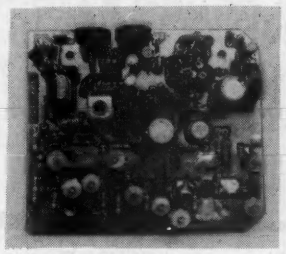
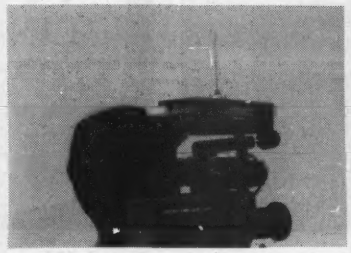
THE "KREEPIE PEEPIE" ATV TRANSMITTER





KPA5 1 WATT ATV TRANSMITTER BOARD FEATURES:

- ★ 1 watt pep minimum RF output on sync tip.
- ★ Full color and sound on one small 3.25 x 4" board.
- ★ Composite video input from camera, VCR, etc.
- ★ Runs on external 13.8 vdc at 300 ma supply or battery.
- ★ Wired and tested board covers 421 to 439 mHz.
- ★ Supplied with one xtal on 426.25, 434.0, or 439.25 mHz but capable of 2 freq operation with the addition of 2nd xtal (add $15). Other 70cm freq. available on special order.
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DO SOME OF THESE APPLICATIONS INTRIGUE YOU?

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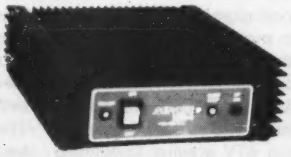
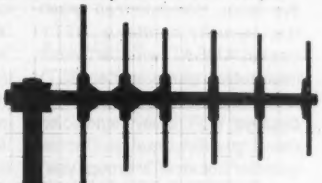
2. MOBILE OR PORTABLE ATV for public service events such as races, parades, marathons, etc. A Mirage D24 40 watt amp can be added for greater mobile coverage or base operation. Mount in an airplane for CAP and rescue searches for an eye in the sky.
3. REMOTE CONTROL OF R/C AIRPLANES or ROBOTS. Fly with a camera in the nose to control as if you are in the plane. Likewise a robot can now be out of site of the operator.
4. REPEATER SITE SECURITY OR COMPUTER VIDEO DISPLAY. Turn on thru your repeater a camera at the site to see the area, weather, read meters, or if a computer is used, show status, play games, etc. by remote control. With all the new technology using TV displays, it is natural for hams to adapt these new products to transmission over the air. What applications come to your mind?

WHAT IS REQUIRED FOR A COMPLETE OPERATING SYSTEM? Either a **TVC-2G** or **TVC-4G** downconverter connected to any TV set tuned to channel 3, and coax cable to a good 70cm antenna to receive. Package up the **KPA5**, add 12 to 14 vdc, antenna, and any home TV camera, VCR, or computer with composite video output. **SIMPLE, EH?**





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UG21 type N male connectors for larger ID coax.....$5

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Photo A. Dave Williams WBØZJP proudly proclaims his hobby on his new license plate.

Photo B. 325-mile ATV DX received by WBØZJP in St. Louis, Missouri.

areas to officials, went on wintertime "hidden video transmitter" hunts with ATV-equipped mobiles, equipped an Air National Guard helicopter with color FSTV gear for some exciting aerial views of our area, and much more!

The Hillsboro, Illinois, ATV gang likes to shoot local parades and pipe the narrated coverage with "on-the-street reporters" into a large nursing home/hospital complex. Washington, D.C.'s Metrovision ATV group (and a number of others in the U.S.) tracked all the Space Shuttle flights, with 24-hour raw video displayed on each mission. Southern California ATVers cover yacht races, the famous Pasadena Rose Parade, and a number of other public events.

ATV repeaters can really get fancy with independent remote transmitter mode positions, which can include touchtone™ screen displays, such as color bars, live feeds, computerized graphics, security cameras, RTTY/packet/AMSAT window feeds, interactive game ports, SSTV feeds, Morse-code mode-testing displays, VCR replays, and so on. Once you become an "active member" of an ATV group, you'll find a whole new world out there full of experimentation, testing, building, education, friendship, and fun.

The Cheap Way to Do It

While I was writing this column in late September, my buddy Don KAØBVT in Moscow, Iowa (whom I got started on FSTV about seven years ago), was attempting a new experiment. I sent him my UHF TV video picture of the shack at about 100 Watts of power, while he tried to receive me direct with no interfaced downconverter on his new cable-ready VCR. The distance between us is about 25 miles over very hilly terrain.

His two 88-element and my four 48-element Jaybeams (along with power) normally will give a P4-to-P5-picture signal level. He saw a good picture of my signal just by tuning below channel 14 on his VCR UHF tuner with his ATV beams being connected to the UHF TV connector! The signal level was about P2 (locked and readable). Then he took his Advanced Receiver Research preamp and added it in-line. My signal was now a rock solid P4 with very little noise! *No downconverter*—just straight UHF tuner receive!

You can try the same thing on today's solid-state TV sets. Some will slide tune down below channel 14 (470 MHz) and catch 430 to 440 MHz. Few go much lower without modification. With the purchase or construction of a good high-gain UHF antenna (and maybe a preamp), this method, although not recommended as a permanent setup for viewing FSTV in your area, might just be a cheap way to try seeing ATV activity! Coordinate your viewing times with those who can transmit a picture to you. You need to know where the video troops are hanging out on 2-meter FM (this information is also included in the SASE package).

Antennas for UHF ATV

ATV manuals will talk about a number of UHF-style antennas that can be used for FSTV operations. Skeleton Slot and yagi antennas are popular, and K2RIW designs (cut for ATV) are beginning to take over third place—but the two multi-element beam arrays that stand out among all others are the 27-element KLM and the English-made Jaybeams.

It is clear that wide bandwidth is needed for the sending and receiving of ATV pictures. Both KLM- and Jaybeam-manufactured products handle this requirement quite well—much better, in fact, than standard, narrower bandwidth yagi designs. The KLM model uses a series of crossed interfaced driven elements to achieve good results, while the Jaybeam relies on the bend designed into the elements.

Both antennas are comparable in gain. ATVers do not always go just for the highest forward gain in an antenna as do 432 EME/SSBers, for example. Transmitting and receiving the 3.58-MHz colorburst and the 4.5-MHz audio subcarrier sound signals are a must! Both models will handle all the power you can legally throw at them. KLM 6-, 14-, and 27-element beams are available at most dealers or via P.C. Electronics. The more popular Jaybeams can be ordered through John Beanland G3BVU/W1 at Spectrum International, PO Box 1084, Concord, MA 01742.

My preference is with the Jaybeams. I run a stacked quad array of 48-element models using a phasing harness. I would run the 88s, but the winds here in the Midwest just won't allow it. With 100 Watts of power, hardline, a mast-mounted preamp, and these antennas, my best summertime FSTV UHF DX has been to WB8ELK in Findlay, Ohio—over 400 miles away! I see P1 to P2 pictures or hear the carriers (on FM/SSB) from Chicago about 150 miles away just about any time I want to. It's taken a lot of work to get that sensitive! Locally out to 50 miles, pictures are usually P3 to P5 in signal strength with the preamp on. As stated earlier, do it right and it will work for you!

Low-Loss Coax Is a Must on UHF

Up until the past couple of years, Belden 8214 and Saxon 8285 coaxial cable were the minimum accepted models in FSTV circles, less, of course, the preferred use of 50-Ohm hardline. Today, Belden 9913 and International/Columbia 1180C are accepted as the best of the flexible RG-8/U-type coaxial cable runs to use on UHF. Loss is rated at around 2.5 dB per 100 feet at 400 MHz. Anything less than these models and you will lose more than one-half your transmitted and received signals. I can't emphasize enough how vitally important this can be. Unfortunately, it is usually the most neglected feature of the station.

Get the best that you can afford to buy, of course. Higher priced, double-shield stuff is not always the lowest loss on UHF. It was made primarily to keep rf out, not in. Spend that extra few pennies per foot for the best.

SSTV—To Go Color or Not to Go Color?

Nearly every hamfest flea market will turn up a number of good buys on older SSTV gear. The Robot Research Model 400 is still

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a very sought after piece of gear. A few years ago, it sold for $795 and you were lucky to get one. Today, the black-and-white units can be found new for $300 or used for between $150 and $250. If you are interested in getting into SSTV but do not want to spend a large amount of money just yet, buy one. Many hams have converted them to color later on.

The units display a very clear picture of 128 pixels across (the little dots on the TV screen) by 128 lines down. Sixteen shades of gray are represented, although you usually can count only seven or eight. This piece of gear is a far cry from the days of P7 image display tubes when W2NSD saw his first boring SSTV pictures.

Bob Walker WB0VVY of Atkins, Iowa, made the conversion to color on his Robot 400 in a few nights with an upgrade kit supplied by Robot Research of San Diego, California. He now enjoys both black-and-white and full color (4,096 colors) SSTV pictures at 8-, 12-, 24-, 36-, and 72-second picture transmission and reception rates. True, the color is not quite as good and detailed as the more expensive top-of-the-line Robot 1200C converters, but then Bob doesn't have $1,300 wrapped up in it either.

If money is no object, then the 1200C converter right now is the way to go on SSTV. Robot Research has a neat four-page informative color brochure on these units. Write to them for details. I would say that about 70% of the SSTV transmissions today are being done in color. But seeing these pictures in black and white is still great viewing.

The pioneering efforts of G3NOX, VE3EGO, K6AEP, W9NTP, WB5MRG, DL2RZ, and others, and most notably those of KD6HF and WA7WOD, have brought color SSTV to what it is today. Some of the best ATV "experimentation" is taking place in the slow-scan ranks. Syd Horne VE3EGO's work in interfacing SSTV with packet radio for error-free pictures is going to be the next big step in SSTV. Tom Hibben KB9MC and Don Miller W9NTP are working together on putting out a "new" SSTV manual. It will be published by the League some time in 1987. There hasn't been a good handbook on SSTV for a number of years, and so much has happened since Don Miller, Ralph Taggart, and Dave Ingram K4TWJ wrote the last ones.

14.230 MHz is still the hot spot to tune in SSTV operations, but some DX is being heard again on 28.680 MHz. When 10 comes back in, be on the lookout for good low-power SSTV pictures once again.

W0ORE's SSTV pictures from the *Challenger* were very exciting for those who were equipped for watching, but wait until the manned space station project gets into orbit and nearly "live" SSTV pictures and perhaps "live" FSTV pictures are transmitted from above the earth. We are working with W5RRR at the Johnson Spacecraft Center ARC for this to become a reality. You will want to be part of it.

Cheap SSTV via the micro is possible at greatly reduced resolution. Dick Kinney of Kinney Software in Hamilton, Ohio, has a couple of versions of programs and interfaces for the CoCo and C-64 computers. I'd personally like to see IBM PC enthusiast Clay Abrams K6AEP take a relook at the new, higher resolution CoCo 3 computer with some of his former SSTV programs. Howard Nurse W6LLO of Commsoft has some very serious SSTV applications for Apple computers interfaced to CCTV cameras.

Whatever route takes you into slow-scan, the important thing is to get on and get your feet wet. If nothing else, tune into 14.230 early Saturday afternoon at 1800 UTC to the W1JKF/W9NTP SSTV net. Jump in, give your call-sign, and tell Brooks or Don that you're interested in getting started on SSTV. They'll take it from there.

A Final Note

These first three columns have pretty much been basic material to get YOU, the newcomer, better acquainted with how fast-scan and slow-scan TV signals originate and are received, along with the types of programming sent over the air. Starting with my next column, I'll concentrate more on specific pieces of equipment, standards, and good operating techniques. More specifically, I'll talk about the camera, building FSTV repeaters, whether to use AM or FM, and a history lesson on SSTV development in the U.S. See you on the tube. ■

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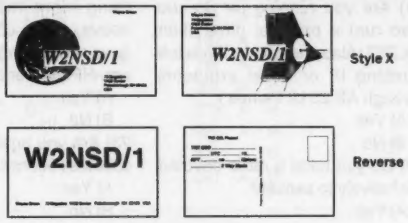

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Now you can get the highest quality QSL cards without spending a fortune! We put these cards on our press as filler between jobs; it gives the pressmen something to do and lets us print QSLs for you at an absurdly low price.

Not that we skimp: All three styles are produced on heavy, glossy stock, in two colors (blue globe or satellite with black type). At these prices, you can start the new year out right by QSLing all those disappointed hams who've been waiting for your card. Tell 'em the card was printed by Wayne!

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Yes, places you've never even heard of! Nearly 400 DX countries gleaned from the Awards Lists of dozens of IARU members—more countries than any other map available anywhere! ARRL's DXCC map doesn't even come close!

73 Magazine offers readers our DX Map of the World for the absurdly low price of only $5.00, shipping and handling included.

Your ham shack will be incomplete without this giant, 950-square-inch, up-to-date map. It's printed in classic black and white, permitting you to color the countries in after you've QSL'd them. (Apartment-sized map available at no extra cost.)

Save yourself the humiliation of never having heard of McDonald Island (what's the prefix?), Jan Mayen (prefix?) or Kure Island (prefix?).

Order now....

Code Tapes

We've had so many phone calls from people wanting our famous 73 code tapes that we've decided to bring them back!

"Genesis"

5 wpm–This is the beginning tape, taking you through the 26 letters, 10 numbers and necessary punctuation, complete with practice every step of the way. The ease of learning gives confidence even to the faint of heart.

"The Stickler"

6+ wpm-This is the practice tape for those who survived the 5 wpm tape, and it's also the tape for the Novice and Technician licenses. It is comprised of one solid hour of code. Characters are sent at 13 wpm and spaced at 5 wpm. Code groups are entirely random characters sent in groups of five—definitely not memorizable!

"Back Breaker"

13+ wpm-Code groups again, at a brisk 13+ wpm so you'll be really at ease when you sit down in front of a steely-eyed volunteer examiner who starts sending you plain language at only 13 per. You'll need this extra margin to overcome the sheer panic universal in most test situations. You've come this far, so don't get code shy now!

"Courageous"

20+ wpm-Congratulations! Okay, the challenge of code is what's gotten you this far, so don't quit now. Go for the Extra class license. We send the code faster than 20 per. It's like wearing lead weights on your feet when you run; you'll wonder why the examiner is sending so slowly!

Classics From 73's Library

•***The Magic of Ham Radio***, by Jerold Swank W8HXR, begins with a brief history of amateur radio and Jerry's involvement in it. Part 2 details many of ham radio's heroic moments. Hamdon's close ties with the continent of Antarctica are the subject of Part 3. In Part 4 the strange and humorous sides of ham life get their due. And what of the future? Part 5 peers into the crystal ball. Only $4.95.

•***The Contest Cookbook***, by Bill Zachary N6OP. One of ham radio's winningest contesters lets you in on the tips and techniques of the Big Guns. You'll learn which duping method to use, find out what equipment you'll need, and discover the secret of building a pileup. Includes separate chapters on DX and domestic contests. $5.95 while they last!

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Giant DX Map of the World	$5.00	_____
Total Enclosed		_____

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Card # _____ **Exp. Date** _____

ORDER FORM

Mail your order to *73* Magazine, WGE Center, Peterborough NH 03458, Attn: Uncle Wayne.

NK6K > PACKET

Number 20 on your Feedback card

Harold Price NK6K
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Redondo Beach CA 90278

PACKET POLL

Welcome to the first large-scale packet radio survey. Even the most incorrigible Luddites now agree that packet has made a significant impact on amateur radio in the 80s. We would be remiss in our duties to future historians if we did not try to record some of the demographics of the early days. Our future selves will no doubt look back at 1986 and laugh that we were still running at 1200 baud and were still shoving audio into the mike jack of our radios.

Please respond to this poll if you are on packet now or if you have been on at any time in the past and (gasp) dropped it. Feel free to not respond to specific questions.

I'd like to get most of the responses via packet (NK6K @ NK6K) or via CompuServe (71635,1174). You may also use paper; just cut out and mail the response form given below to the address given at the top of this column. I've asked that this column be printed with one of the W2NSD editorial pages on the back so you won't miss anything important when you cut out the response form, but in case that doesn't work out, feel free to send in a copy or scrawl your responses on a piece of paper of your own choosing.

If you reply via packet, put several number/letter pair responses on a single line to speed up the transmission from BBSs that send one line per packet, and separate the responses by commas: e.g., 1b,2c,3a, etc.

If, on the off chance that you've read this far and aren't on packet, and you think that packet is ruining amateur radio, by all means mail in a piece of paper with "No on Packet" written on it.

Definitions

For the purpose of this survey, "packet" is used as a shorthand word for any high-speed digital communications over amateur radio. This is just as wrong as saying "2400 bps" is the same as "2400 baud," but you know what I mean. So, in this survey, high-speed digital is defined as 300 baud and up, without using the Baudot or AMTOR techniques. Thus, the 9600-baud polling system used in eastern Canada in the early 80s counts as "packet." VHF is shorthand for "not HF" and includes 2 meters and above. BBS is short for any system where a computer is the primary "operator"—bulletin boards, mailboxes, file servers, hosts, private message systems, etc. TNC is short for whatever device it is that you use to do your high-speed digital communicating with.

Finally, thanks to WB6YMH and KA9Q for reviewing and suggesting some questions, and an acknowledgment to the annual KI2U Fun! poll, where I lifted some of the demographics questions.

1) Sex:
A) Male
B) Female

2) Age:
A) 15 or below
B) 16–21
C) 22–39
D) 40–59
E) 60 and up

3) License class:
A) Novice
B) Technician
C) General
D) Advanced
E) Extra

4) Number of years licensed:
A) 1 or less
B) 1–5
C) 6–10
D) 11–20
E) 21 or more

5) Year you first used "packet":
A) Before 1980
B) 1980–1983
C) 1984
D) 1985
E) 1986

6) I first heard about packet from:
A) Friends/on the local repeater
B) Demo at a club meeting
C) Demo at a convention
D) Demo at Field Day
E) Magazine articles

7) My job is (or used to be):
A) Computer related
B) Rf related
C) Other

8) Aside from jawing on the local repeater, has the majority of your amateur radio activity lately been packet related?
A) Yes
B) No

9) Number of TNCs owned:
A) 1
B) 2
C) 3
D) Many

10) Do you use the AX.25 protocol?
A) Yes
B) No

11) Are you running (or do you also run) a protocol other than AX.25? (Also answer yes if you are pushing IP or other protocols through AX.25 UI frames.)
A) Yes
B) No

12) Do you have a radio devoted exclusively to packet?
A) Yes
B) No

13) Do you run a digipeater or other digital repeater where that station is up 24 hours a day and its primary purpose is to relay data for others? (Don't answer yes if you simply have DIGI ON set in your TNC.)
A) Yes
B) No

14) If you run a HOST/BBS systems, do you:
A) Run an WØRLI or RLI-clone BBS
B) Run a BBS that can forward to/from RLI systems
C) Run a different type of BBS
D) Do not run a BBS

15) Where do you use packet?
A) Mostly on VHF
B) Mostly HF
C) HF and VHF

16) Your packet operation is:
A) Mostly real-time person-to-person chats
B) Mostly BBS messaging/file transfer
C) Both

17) Do you have a forwarding BBS (RLI-style) in reasonable range of your station (one or two hops)?
A) Yes
B) No

18) Do you make frequent use of the forwarding feature of your local BBS?
A) Yes
B) No

19) Have you built or designed anything for packet, for your own use or others? This includes hardware (TNCs, modems, connect alarms, tuning indicators, etc.) and software (terminal drivers, BBS systems, etc.). Kits don't count.
A) Yes
B) No

20) Did you put your TNC together from a kit?
A) Yes
B) No

21) Would you be in favor of some type of "digital license," one that gave primarily digital privileges on non-HF frequencies, required a technical test with digital-specific questions, and did not require a Morse-code test?
A) Yes
B) No

22) Would you be in favor of something more than the question above, a "no-code" license that gave wider ranging privileges on non-HF frequencies?
A) Yes
B) No

23) Are you against ALL types of codeless license?
A) Yes
B) No

24) Did you get your ham license as a result of hearing about packet radio?
A) Yes
B) No

25) Do you know of anyone who got his license as a result of interest in packet radio?
A) Yes
B) No

26) The computer you currently use for packet is:
A) Commodore 64
B) Apple II
C) Z-80/8080-based system (Xerox 820, etc.)
D) IBM PC/XT/AT and clones
E) Macintosh
F) Dumb terminal
G) Other

27) On the computer you use for packet, do you have:
A) Floppy disk drive
B) Small hard disk (10 meg or less)
C) Large hard disk (greater than 10 meg)
D) No disk storage

28) What do you think about hams who send "digipeater on" beacons?
A) Tar and feather 'em
B) Put 6" steel spikes in their eyes
C) Put bamboo shoots under their finger nails
D) Beacons don't bother you

29) The "packet network" available in 1986 is:
A) More than you thought it would be when you first got on packet
B) Less than you thought
C) Pretty much what you'd expected

30) Is HF your only link to other packet users?
A) Yes
B) No

31) Is HF your only link to a BBS system?
A) Yes
B) No

32) Most of the data sent on packet today is message text or programs. There are also several oth-

RESPONSE FORM

1) A B	13) A B	25) A B	36) A B C D
2) A B C D E	14) A B C D	26) A B C D E F G	37) A B
3) A B C D E	15) A B C	27) A B C D	38) A B C
4) A B C D E	16) A B C	28) A B C D	39) A B C
5) A B C D E	17) A B	29) A B C	40) A B C
6) A B C D E	18) A B	30) A B	41) A B C D
7) A B C	19) A B	31) A B	42) A B
8) A B	20) A B	32) A B C	43) A B C D
9) A B C D	21) A B	33) A B	44) A B
10) A B	22) A B	34) A B C D	45) ___
11) A B	23) A B	35) A B C D	46) A
12) A B	24) A B		

er types of data, such as digital audio, digital video, graphics, telemetry, etc. Regarding non-text data:

A) You have used non-text digital communications

B) You would use it if equipment was readily available

C) You have little interest in non-text digital communications

33) Do most of your packets go through a digipeater?

A) Yes

B) No

34) How many digipeaters can you hit directly? (By digipeater, I mean a device or TNC on the air 24 hours a day with the primary purpose of being a digipeater. Remember to include all the frequencies in use in your area.)

A) 0–2

B) 3–6

C) 7–12

D) 13 or more

35) How many BBS systems can you hit directly?

A) 0

B) 1–2

C) 3–6

D) 7 or more

36) How many BBS systems can you hit using no more than one digipeater?

A) 0

B) 1–2

C) 3–6

D) 7 or more

37) Have you used packet in a public-service activity?

A) Yes

B) No

38) Do you think the current Part 97 regs on digital communications are:

A) Too restrictive

B) About right

C) Not restrictive enough

39) Is packet a part of your local emergency communications plan?

A) Yes

B) No

C) Don't know

40) In your area, are the packet frequencies:

A) Too crowded

B) Sparsely populated

C) Just fine

41) In your area, how many VHF frequencies are in active use for packet:

A) 1

B) 2

C) 3–6

D) More than 6

42) In your area, forwarding BBS systems are:

A) Using too much channel time

B) Not a problem

43) Regarding your packet use, do you:

A) Use it less than you once did

B) Use it more now than before

C) Stayed the same

D) Dropped it all together

44) Were you a Baudot (RTTY) or AMTOR user before you started on packet?

A) Yes

B) No

45) Enter the two character post office abbreviation for your province or state (in North America) or your callsign prefix (including number) if you are DX.

46) Enter A if you saw this poll in *73* Magazine.

A)

QRP

Number 22 on your Feedback card

Michael Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

Last month we talked about mail-order parts suppliers. Let's look into some of the smaller suppliers. In particular, the suppliers that handle the makings of QRP radios. After that, we'll look at some of the more common parts that should be in everyone's junk box.

If you're looking for a one-of-a-kind part for your latest project, send an SASE to KA1BUQ at PO Box 249, Luther MI 49656. Here you'll find Doug DeMaw and son. While not sending out a catalog proper, their flyer always has the latest in QRP rf devices and other goodies.

Toroidal Cores

I seem to hear it all the time. Why do they use those rotten toroids in almost every QRP project? Well, I don't have the space to answer that one for now, but maybe later. I do know you should send for the latest information about toroidal cores to Amidon Associates, 12033 Otsego Street, North Hollywood CA 91607. Amidon sends out a slick "tech-data" flyer that I use all the time. It's worth having by itself. Amidon will sell in single lots and has very quick service. I'm sure you'll find them a welcome supplier.

Coils

I can solder up a storm all night long. Burn the midnight oil working the bugs out of a transmitter. But I just can't stand to wind those coils. Well, help is nearby. Caddell Coil Corp. just loves to wind coils. Many of the coils used by the most popular projects found in the ham magazines can be purchased from Caddell. Write to them for their latest catalog at 35 Main Street, Poultney VT 05764.

PC Boards

While winding coils is surely not for me, I really don't mind making the printed circuit boards. But there sure are a lot of people who hate that as much as I hate coil winding. For those of you who would rather shell out the bucks, drop a letter off to Circuit Board Specialists, PO Box 969, Pueblo CO 81002. While they don't print an expensive catalog, they will send you a flyer listing their newest boards. As their stock changes all the time, you'll keep your catalog file updated with CBS's latest flyer.

With more and more QRP projects requiring circuit boards, several other board manufacturers have appeared. Among the best of the lot is A & A Engineering, 7970 Orchid Drive, Buena Vista CA 90620. Send for their latest catalog. It also is updated as new projects come on line.

In the past two months I have mentioned a lot of parts suppliers. All of these I have done business with and have had very good results. As consumers, we should always keep one eye out for trouble. If you have done business with a supplier and had good results, drop me a line. We'll tell the world of their good business practices. Likewise, if you've had trouble with a supplier, let's get the word out.

Catalogs

I have been building QRP projects for quite some time now and have never run across a part that I could not find. Oh, yes, I had to do some letter writing to find just what I needed and perhaps paid more than I wanted to, but I always got the project done. If you don't have time to write for catalogs, how do you get a supply? That's really quite simple and very easy. In the back of this magazine you'll find the Reader Service card. Mark the advertisers' numbers, drop it in the mail, and then sit back and wait. In a short time

you'll be up to your nose in catalogs. Suppliers that choose not to use Reader Service numbers should be contacted directly. When you place an order with a supplier, mention that you saw the ad in *73*. That way the supplier has a way of tracking his advertisements.

Selecting a Supplier

Now that we've armed ourselves, let's determine which supplier to send our order to. I use several benchmarks in my purchasing. For an example, let us say that we need some IC chips for a CMOS keyer. I would first gather up all the catalogs from the suppliers that sell chips. Next, I would look up the price of 555 timer, 2N2222, 7400 TTL, 4001, and 4011 CMOS chips. Next, I would look up the prices of the chips that I need for the keyer. Compare the prices.

Stop now for a second. I may see that one supplier has a lower price than all the rest, but they have a $20 minimum order. They don't really specialize in IC chips, but rather in rf parts. That should make you think. Do they get their IC chips via a broom on the afternoon shift? Does their selection contain only a few of the very common types? Makes you wonder. If you're buying ICs, then stay with a supplier that makes a living selling them. There are, of course, several suppliers that sell a very large selection of both chips and rf components and do a very good job at both.

Now that I have picked the supplier for the parts, I look over the junk box. Since almost all mail-order firms have a minimum order and the total price of all my keyer parts comes to a little over eight bucks, I have to come up with the minimum order. The following is one part of Mike's Rule of Ten: I need only two 4011 chips for my project. They sell for 25¢ in single lots. That's a very popular chip. I use them all the time. The junk box has only one left in the drawer. In lots of ten, the price falls to 20¢ each. If I have the extra money, I'll order in units of ten, stock up the junk box, and have what I need for the keyer.

By keeping a close eye on the junk box, you can order what you need and save some money. I just hate to shell out two bucks for a 555 timer at Radio Shack (even if it is seven at night) to finish up a project. If I keep a good stock on hand and order in lots of ten, I don't have to. You never have enough 555 timers or 2N2222 transistors. (I really think that somewhere, someone will come out with a circuit for a color television using nothing but 555 timers and 2N2222 transistors. I plan to have enough of them in stock so I can start construction.)

The order is written out. Postage and handling charges are figured in. How you pay for the order, however, will help determine how long it takes for your order to get to you. Depending on the firm, personal checks take up to two weeks to clear the banking system. CODs cost extra and some firms will not ship COD. The best way to pay is with plastic money. Visa and Mastercard are honored by most mail-order firms (but be on the lookout for a service charge on credit card orders).

Many mail-order firms have toll-free phone numbers. Placing your order this way and using your credit card speed things up. Some companies have a higher minimum for phone orders.

In about a week the order arrives. Heat up the soldering iron and start to enjoy ham radio's best. There is nothing like the excitement of using gear that you put together yourself.

Junk Box

The best part of home-building your equipment is having the parts on hand. The QRP workshop should have resistors on hand from 100 Ohms through 2.2 megs. Transistors should include the 2N2222, 2N2906, MPF102, 40673, 2N3553, and 2N4416. The popular 1N914 diode should also be stocked.

Toroids should include FT-37-43, T36-6, T68-6, T50-2, T50-6, FT37-61, FT37-63, FT50-43, FT-37-2, T68-2, and T37-4. Add some ferrite beads to the pile also.

The following rf chokes will fit 90% of your needs: 1 mH, 10 uH, 200 uH, and 10 mH.

Capacitors, both electrolytic and ceramic, should include .1 uF, .01 uF, .001 uF, .2 uF, .005 uF, 100 pF, 560 pF, 470 pF, 330 pF, 47 pF, 56 pF, 750 pF, and 820 pF. Of course, the smaller values are either silver micas or polystyrenes.

This is just a small list, but expanding your junk box will allow for more flexibility with your next QRP project. ■

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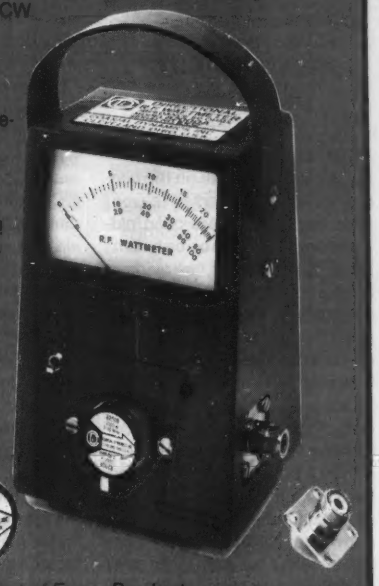

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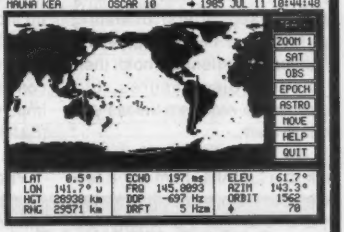

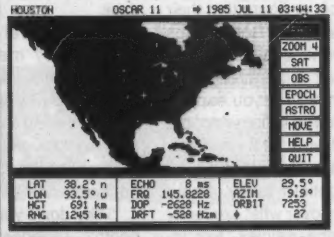

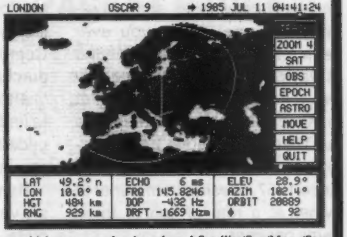

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FUN!

Number 15 on your Feedback card

John Edwards KI2U
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FLEAING WITH MY LIFE

With summer just a faded memory, it's time to reflect on the concluded ham flea market season. Ham flea markets are good old-fashioned All-American fun. Heck, Field Day and flea markets are the only times many hams get out into the clean, healthy sunshine. Heroin addicts and prisoners have healthier complexions than most hams.

Going to a flea market is an exercise in escapism. You meet celebrities (I spotted famed subway gunman Bernie Goetz at a Long Island flea market this year), you eat hot dogs, fondle microphones, and ogle amplifiers. FUN, indeed. But there's a flip side to the coin as well—selling merchandise at a flea market.

If you've never sold stuff at a flea market, you should give it a try, since it's an experience no ham should miss. I'd rank it up there with going on a DXpedition to a tropical island, visiting ARRL headquarters, or eating the food at a ham banquet. All of these experiences hold their transitory displeasures, but you're not a *real ham* unless you endure them.

I got my taste of selling ham junk at a LIMARC ham fair a few years back. Ham junk, incidentally, is an interesting phenomenon, endlessly recyclable and apparently immortal. Have you ever seen a boat-anchor Hammarlund at Dayton that you swear you saw two years earlier at a flea market in Arizona? Radio amateur deja vu. That Hammarlund has probably been on the flea market circuit since 1957, passing from owner to owner at a rate of two or three hams per year.

My inspiration to sell ham junk came when I opened my garage door and saw a Hallicrafters SX-111 bounce off the roof of my '72 Corvette. Oops! Well, roof panels can be replaced fairly easily, if not inexpensively. (I got the new ones at a car-collector flea market, but that's another story.) So, fearing more potential body damage, I loaded my excess effluvia into my Ford and pointed it toward the Islip Speedway, the home of the LIMARC flea market in those days.

Pulling into the Speedway's parking lot, I paid my seller's admission fee and found a nice parking spot/sales location near the portable toilets, a locale guaranteed to attract a crowd. The fragrance, if you can stand it, also keeps browsers from cluttering up the area around your table. Since my job requires me to deal with PR flack on a regular basis, I have no trouble with odor.

There is an art to setting up a flea market sales table. I used a couple of folding picnic tables, which work nicely as long as you don't put too much weight on them (they bend). The idea is to place the cheap small stuff up front and the expensive big stuff in back. Few people make an impulse purchase of a $700 computer, but many are likely to impulsively pick up a 50-cent book (Barry Goldwater's autobiography was a big seller for me).

Price tags are also a must. Hams, as we know, tend to be wimps. Many are too bashful to ask for a price, or figure that their job as a driver for the Gotham Bus Company won't qualify them to purchase your high-quality merchandise. Anyway, if you happen to find a ham who is outgoing, the price tag will work as a good bargaining point.

Hams negotiate funny. Some are very picky over what are really quite mundane articles. For instance, I remember one fellow who made a big deal out of a BNC connector.

"This a BNC connector?"

"Yep."

"How much?"

"Fifty cents."

"What's it made out of?"

"I dunno. Metal, I guess." I'm getting bugged.

"It looks dirty."

"Wash it."

"I'll give ya thirty cents."

"No way," I say.

"Forty cents."

At that point, I picked up the connector and threw it at the guy's head. It missed.

He said, "No deal, I guess."

I said, "You're right, I guess."

The BNC broke the windshield on a nearby sedan.

Then you have the hams who will buy anything. For instance, there was one guy who bought a $220 Heathkit oscilloscope from me. It was only about a year old, and I was selling it for pretty close to list price. He didn't negotiate at all. "Like the scope, hate building," he said.

The strange part was that the OM didn't plug it in, didn't check my construction—nothing. Now, I'm a pretty good craftsman. I keep my leads short, tighten my screws, and apply white hot solder. But he didn't know that. He *trusted* me. I don't even trust myself. He paid me cash. He didn't know who I was. If it had been a bum scope, he would have been out of luck. Weird.

But the best part of selling at a flea market is meeting all of your friends.

"Hey! It's KI2U! Mr. Fun!" Oh, God, no. It was Jack, a flake who habituated a local repeater. Some dogs have fleas; this repeater had Jack.

"Lookee here! A box of floppy disks! They make great Frisbees!" A shrill laugh filled the air. Several nearby hams ducked for cover, thinking an ambulance was plowing through the crowd.

I grabbed the disks out of Jack's hands.

"Why don't you visit the ARRL booth?" I suggested.

"They chased me away three times," said Jack. "I decided to give equal time to Wayne's exhibit. Hey, is this cheap folding table the best Wayne could afford?"

"This isn't Wayne's table," I replied. "It's mine."

"Hard up for cash?" he said.

Before I could answer, a butterfly skittered by and Jack ran after it. He never came back.

A small miracle. But I wasn't out of the woods yet. Joe the DXer was headed my way.

"Fresh out of countries, Joe?" I said with a smile.

"Hmmmm," grumbled Joe. Like most honor roll DXers, Joe took ham radio seriously. It wasn't a hobby to him. It wasn't even a business. It was a sort of hair shirt.

"Got a 6146B?"

"Yes I do, Joe. It's right here. Let me see . . ." As I was reaching toward my tube box, a crackle shot through the air and a panicked, garbled voice screamed out of Joe's HT.

The blood drained from Joe's face.

"What is it, Joe? An emergency?"

"You bet," he said. "Flackaran's on 20."

Like Jack, Joe never came back either. In fact, I never heard from Joe again. I suspect he moved a bit closer to Flackaran.

On the whole, the day turned out to be profitable. I made $325, got a nice suntan, and learned something about my fellow hams. Would I do it again? Not on your life.■

ELEMENT 1 TRUE-FALSE

	True	False
1) After writing Fun! for more than five years, KI2U has finally exhausted his supply of ham trivia.	____	____

THE ANSWER

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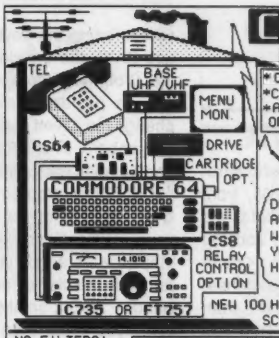

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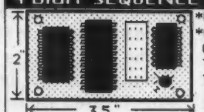

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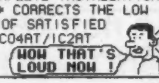

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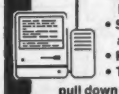

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RTTY LOOP

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Marc I. Leavey, M.D. WA3AJR
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Sometimes I wonder just how many of you pay attention to the little "tease" I try to leave at the end of each month's column. To save you the trouble of looking back, I alluded to the perennial contest I face answering all of your mail. Well, here I go.

Ed Kotz NG0R of Roggen, Colorado, writes with some modifications to the HAL ST-5A demodulator for computerized interfacing. You all may recall that back in July I recounted Ed's tale of woe in trying to make his secondhand ST-5 operational. He related that my "seed" in saying that the FSK output used ±15 V dc got him going. He devised the modifications shown in Fig. 1, which have his demodulator copying S1 signals, and even some buried in the noise, with good results. I thank Ed for his contribution, and I am sure that you all do, too.

Another letter this month comes from Gregory McIntire, who introduces himself as an SWL from Belle Fourche, South Dakota, and who has been enjoying copying RTTY on his Commodore 64 computer. Why not try to get a license, Greg? Transmitting is more than half the fun! Anyway, Greg has been looking at one of the more common RTTY exchanges, that of sending various forms of artwork by sending strings of MMMXXX III:::.:IIXXMM or such to create a likeness of anything from a girl to the man in the moon.

As Greg says, "I decided that this mode (RTTY) and its capabilities could be utilized for something more constructive. Why not use RTTY to send high-resolution pictures? How about hi-res schematic diagrams for the many electronics enthusiasts of the amateur community? Since I had never seen any software for the purpose of doing this, I decided that I must write the software myself. I did, and this is how it works with RTTY. First you 'draw' a schematic diagram on the C-64 monitor screen using the keyboard. Next you SAVE the drawing as a disk file. (You may also print the drawing on paper.) Now you can change the saved disk file to a list of numbers. This is saved as yet another disk file, either a sequential (SEQ) or program (PRG) file type, depending on which type your RTTY software requires. You may now 'fire up' your rig and transmit the list of numbers via Baudot, ASCII, or AMTOR. [I assume you could even send them via Morse.—mil] The person on the receiving end will also need a C-64 or C-128 and a copy of my software to reproduce the hi-res drawing."

I have printed Greg's icon menu and diagram in Fig. 2 and the list of numbers generated to reproduce the diagram in Fig. 3.

The concept is a good one, Greg, although not totally unique. The TRS-80 Color Computer crowd has a program called PIX-CMP, which does essentially the same thing with high-resolution CoCo pictures. In fact, the CoCo Program Listing included here will reconstruct the diagram shown in Fig. 1.

Now, here comes the hook. Why not work up a system that is computer independent? If you could come up with a scheme to generate a number list that could reproduce a similar picture on Commodores, CoCos, PCs, and even Ataris, *then* you would have something. I might even hazard a guess that *73* might be interested in printing the programming. Of course, if they won't, I will. Let me hear from you with your developments.

Staying with the Commodore fleet (sorry), here's a letter from Bob May, II K4SE of Jonesboro, Tennessee. Bob writes that for the past three or so years he has been using a VIC-20, Kantronics' Hamsoft program, and the MFJ-1224 interface for RTTY. He has been quite satisfied with the results. Recently, he bought a Comrex CR-220 printer, which works well on his Commodore software, particularly the word processor. However, when he pushes the control-P, while "P" appears on the screen, he gets nothing on the printer in either transmit or receive. He has tried another VIC-20 with similar results and wonders if I have any idea of what's happening.

Well, Bob, while no one I asked was familiar with the exact combination, a common problem did suggest itself. The programming for special keyed functions is of-

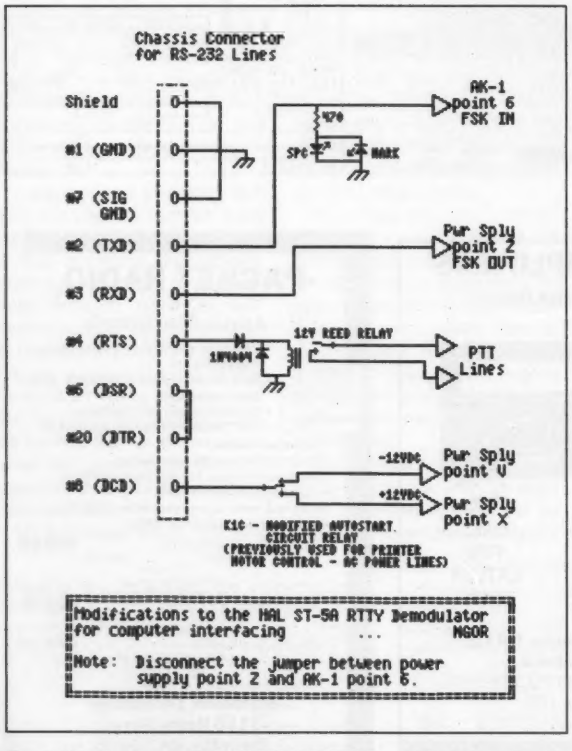

Fig. 1. Modifications to the HAL ST-5A RTTY demodulator for computer interfacing.

```
1 PCLEAR4:CLEAR200,&H5DFF:FOR X=&H7E00 TO &H7E95
2 READ H$:POKE X,VAL("&H"+H$):NEXT
3 DATA 9E,33,30,6,10,8E,5E,0,86,8,A7,8C,3A,86,6,A7,8C,34
4 DATA A6,80,80,30,48,48,48,59,6A,8C,29,27,E,6A,8C,25,26
5 DATA F4,E7,A0,C6,8,E7,8C,1C,20,EB,86,6,A7,8C,14,A6,80,26,A
6 DATA A6,4,81,22,26,C,30,5,A6,80,80,30,48,48,20,D9,0,0
7 DATA 8E,5E,0,10,8E,E,0,A6,80,A7,8C,42,6F,8C,40,A6,80,A1,8C,3A
8 DATA 26,F,E6,80,A6,80,A7,A4,8D,10,8D,1D,5A,26,F7,20,4,A7,A4
9 DATA 8D,5,8D,12,27,E2,39,10,8C,25,ED,24,4,31,A8,20,39,31,A9
10 DATA EB,21,39,6D,8C,F,26,B,10,8C,25,FF,26,3,6C,8C,4,1A,4,39
11 IFPEEK(&HC000)=68THEN DK=1:GOTO 13
12 POKE&H7E4D,6:POKE&H7E78,&H1D:POKE&H7E8C,&H1D
13 PMODE4,1:PCLS1:SCREEN1,1:READZ:EXECM7E00:FORI=1TO5000:NEXT
14 CLS:LINEINPUT"FILENAME FOR PICTURE: ";F$:IFF$=""THEN 14
15 IFDK THEN SAVEM F$,&HE00,&H25FF,&HA027:END
16 CSAVEM F$,&H600,&H1DFF,&HA027:END
17 DATA1
100 "!_GPoiJX^mJ(Vo@Booj\!Zh5E?@BooR_!ZP5[O@Boobf!j'3Z?@BooR_!:!
101 "3[?@Booj\OZP5[_@Boob[O:\3[?@ZooQoIWIfHo@Bogob4_moOaeoI@BoOg
102 "eoogsb4_moOaeoOo@Fogob5?aeoomoOo@BLooTmgCgm>?@BomVfMgAf^=ob4
103 "Do!JWJmMCMOooWfaeC?n?@!:ma2mO@em_Mob4OoAJWIaPKXO!@7odKIfLGFf
104 "goBAeo6,jWNYjYMob!DogakNgJ!Ob4_mdUXJV]!Cb4_o6!PC!a_oo!9J6YEJ
105 "dIPIo^=K^kJJhI@jo^=K^k!JhI@jo^g^kng^!@joj@Mk;@w!Tjo#k^a_K
106 "ekmoBAognoocno?oooMk^a_KekaoB9ogNk_KfaNoOb4Dag^kfa_8_g!@7oM
107 "k_mOKekmoBAogNk_Gem^oOb2OnKJ7JkJi_oamn\^a^k_?:conMkHeJBoooo
108 "odJO8mob3?oeooob!?OolPCgoo84moob1?OolPCgoo84moob1?OolPCgoo8
109 "4moob1?OolPCgoo84moob1?OolPCgoo84moob1?OolPCgoo84moob1?OolP
110 "Cgoo84moob1?OolPCgoo84moob1?OolPCgoo84moob1?OolPCgoo84moob1
111 "?OolPCgoo0gmonLN@?N?Ool!Ok!!O8!!Pco@8EoobIK!!j@jmO84e_Ub
112 "4_o!IPCfn0BOobIk!Kij@jmO84e_Nb4_o!IPCfn0BOobIk!Kij@IPfokoo
113 ">kno6ooo?Imo\Jiob3?n?ooob!?Oom'3goob1?OolPCgoo84moob1?Oo0?
114 "Ogmoob1?OolPCgoo84moob1?LO!PCgoo84moob1?OolPCgooOgm'3olPCgo
115 "o84moob1?OolPCgoo0g07OolPCgoo84moob1?OolPCgo'3gmoOolPCgoo84
116 "moob1?OolPCgo'7emO8mlPCeoO8eoOlcognoOoolngm<noGI@Bo07@Bo'3
117 "b5olOlQOo07@Bo'3b5_lOlRGoWfakNf^Lool<jio\JiBb3OlOlQOn07@BoP
118 "3b5olOlQOo07@Fo'3b!Oo2c>c\mOBolIJFUIJoonOMkmoMkbjOlOlPOoo
119 "_@Mo'3b5olOlQKo07@5oeIEA7EflQco?MKAemkoogonOgm67@Io'7moOgP
120 "gKJgk_@Mo'3b5olOlG?oMcL@OlLgMoookEE4Enob6oonajjn_\Ooon>JK@
121 "eJ_8aoaoO_gob:?lOlQOo07@Fo'3no_k'oWahL7inlPOnlQ@oLng]lG?ooo
122 "mlJg_mLo@FoocbA_dlQOo07@Fo'3ooolOoglo7o@B@o'3no_k'kJfkMo@=o
123 "ol_OgmolQko07@Eookao_olITCo07@Fo'7moOglooolooolooloQgmOOoo
124 "o'o_gkmolS3o07@EodtEcEgNlRcoP7@6_cob4?o^cMkla?@SomM@EmM@EmM
125 "@EmB?!loOgmnognO_so_gkoOgeo?gmoKJ'n7gPOOgeo7@Zo'3b!?o@Em
126 "O_Kooo!?oonlGKgmoO'7@oo'3oooOelKmO@7o'3omoKeJeoo?oooo'3b!
127 "_!OlRSoc=@<cMCoogjlo_@So'3b?olOoooKe07enob1oIP_o07@Zo'3b
128 "!?m4gLgMA?ooo'3blolOlSoo07@?o'3no_k'o^aMK!knoP3b!?k'kJfkMo@
129 "@o'3bs?olO8alo0ooo'3blolOlSoo07@Coaoo0C'LoOgb1_!?kmnoOo@o'
130 "3bs?o5@LgMA?ooo'3blolOlSoo07@EofaEA5AE!Rco07@IongEa]IFoooo0
131 "?@7o'3b?olOlQ@oodoOcsOBj?lOlRSoOgob1_!OlPOo07@oo'3bA_lOlS3o
132 "07@7o'3b?olOlQKofO?NOo'3blol?!PO_h7@@oca7LgaoOgmlLdlolBKolPK
133 "n?dmcO7moOgacCcob?_o?dmcOgaoOgmcCcoB5olOGm=07moOg=??lRoolO
134 "HfO@7gaoBhocoBecBen_oooo4?@Kaao0'mo7gaoOb9?!ocn???o8joco?!
135 "!lolRMoo_gao?gmoooockJgJlkoohJaSfns__@cob!@7cnooooockJgJlko
136 "olfeg>fcO8MooSknooOMmlOWh!RgoKJ^WjfJoomohfe3K@goOff
137 "!if^]KO8boo?!mo_JlooOn=]KFdJoonoOmo_kob9oo2MgOgmOoooo7!3
138 "!JFo@JookloPkno?oo_ano_joOool!PCno?@oo'MKVl^77mo_ano_joOo
139 "olj!PAI?7@KoaobIKoooolIfcpn)O@bogoOon?Oam_KiooofI_3daJK!S?o
140 "!PCKHo_M'o_gkmo3ooa3!PAgao9!oo
```

Program Listing. A CoCo program to reproduce Fig. 1 (PIXCMP format).

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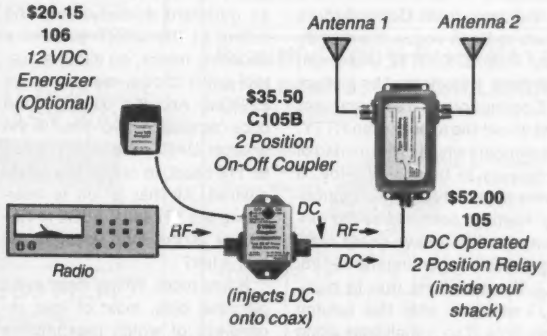

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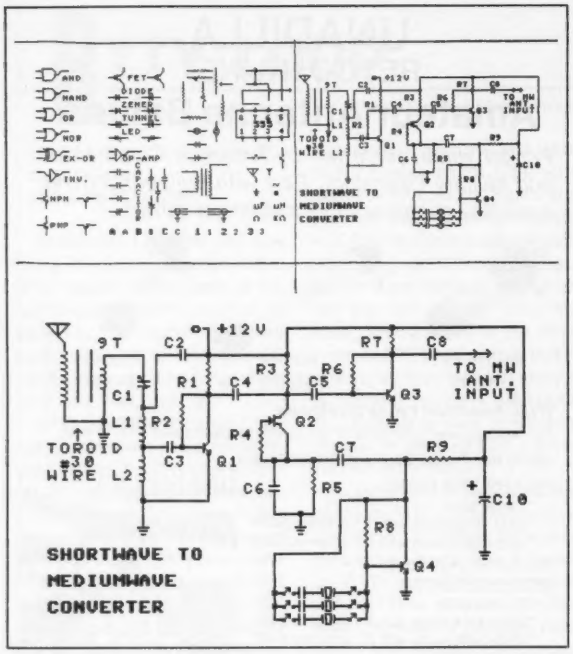

Fig. 2. The top left "screen" is a Menu screen that shows the various symbols that can be printed. The picture at the top right is an example schematic diagram. The lower picture is an enlargement of the top right picture.

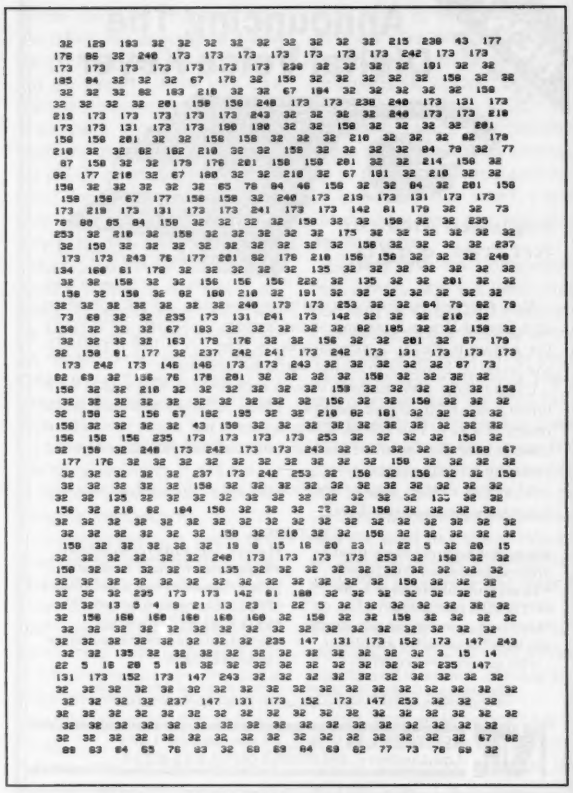

Fig. 3. List of numbers (saved as a disk file) that are transmitted via RTTY and used to reproduce the schematic drawing in Fig. 2.

ten software dependent. That is, it is the word processing software that interprets the control-P to output hard copy. The Hamsoft program probably does not have this function built in, or if it does, it is reachable by another command. I'll monitor the mail here for input from other users not reached to date and publish what I find out right here. Thanks for the interest.

Maydays from Commodores seem to be in vogue this month. Roy Hoelke KA7TTZ in Heron, Montana, tells me that he just got a Commodore C-128 computer and would like to put it onto RTTY. He wonders which of the myriad of programs to buy. Well, Roy, if sheer popularity counts, Kantronics' Hamsoft seems to be the runaway favorite. I have heard nothing specific regarding the C-128, but, if nature runs true to history, I will—just after this column sees light. If so, I shall pass along the info.

Sometimes the fruits of technology make what was once the complicated solution the simpler one. Take, for example, the problem posed by Richard Steck W9RS of Lake Forest, Illinois. Richard asks if I know of a simple, low-cost way to convert AFSK (170-Hz shift, 45.45 baud) Baudot transmission to ASCII at 110 baud. There is a station in Chicago, he relates, that transmits weather information on 147.06 MHz, and he would like to get hard copy without getting a "Baudot klunker." He adds, "I would prefer not to tie up a computer for this."

Why not? At one time, I would have recommended a hardware solution, beginning with a clock running at 45.45 baud, driving a UART to receive the output of an outboard demodulator. The output of the UART goes to a decoding matrix, on either a custom-built diode matrix or an EPROM. And the output of the code-translation chip goes to yet another UART, this one clocked at 110 baud, to output the ASCII desired. All that is left is interfacing the TTL-level ASCII to RS-232 or 20-mA loop voltages. All that is left?

But no more. While I may have a personal bias, most of you, regardless of which inexpensive computer you are attracted to, particularly the CoCo or the Commodore, should be able to put together a receive-only system—using either a software-demodulation scheme or a simple one-chip PLL demodulator as I have described here in the past—for less than $100. If you are a bit of a hacker, an old 4K CoCo can often be had for a song from computerists who have "stepped up," and it will do quite nicely. Ask around, I think that you will find it is both easier and cheaper to "tie up a computer for this" than to go through the tsoris of building a dedicated Baudot-to-ASCII converter.

Lance Miller, PhD N4LXE of Lakeland, Florida, tells me that he is "hooked" on RTTY. He tells me that he's been reading RTTY Loop for the last year or so, and the issue describing the simplicity and low expense involved in beginning RTTY really did it. He dusted off his old DX-100 and read some more columns. In another RTTY Loop he discovered how to QSY the vfo, and at the Orlando Hamfest he fell into an ASR-33, in really beautiful condition—but with no manuals, of course.

He goes on, "After almost blowing out both inguinal rings lugging the thing across the parking lot to the car, I began to have a second thought or two. The thoughts multiplied during the drive home. 'Miller, you've been out of the hobby for a long time—technology has passed you by, and you don't know a dang thing about Teletypes®!' Nevertheless, I got it into the shack, with all intercalary discs intact, and began inspecting my prize, only to discover that I *don't* know a dang thing about Teletypes. Then I recalled that old WA3AJR [old?—mil] sez in his column every month, 'Drop me a line—be sure to include an SASE.'"

Well, Lance, I am sending you some of the material that's been printed here in past issues of RTTY Loop, and I hope it helps. One of the first things I hope you learn is that most, if not all, Teletype machines break down into several pieces. I, for one, normally break one down before attempting to carry it–you may have to make more trips, but it does wonders for the back! Enjoy and good luck.

Another Teletype acquisitionee (neologiophiles, take note) is Jim Cregger KA0OZB in Jefferson City, Missouri. Jim would like to hook up a Model 33 Teletype to his TI-99/4A computer. Well, Jim, as I have covered here in the past, this should be possible with a circuit to convert the output of the computer, which is, I believe, RS-232, to the input requirements of the printer, a 20-mA loop. I am

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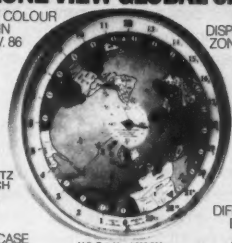

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sending you some material from old columns which may be of help. Please let us all know how you make out with this one.

Regards to Jim Walroth N3AWS, who sent along his comments regarding the TRS-80 Model 100 material published here some months ago. Jim sent his comments on CompuServe and added his wish that I publish an update of the RTTY BBS list we had here some time back. I would love to, Jim, but no one, *no one*, has sent me any updates to that information. I would not doubt that packet has taken over many earlier Baudot or ASCII BBSs, but surely there must be some new activity. I guess they are not looking for any new users. Hint, hint...

I should not have to remind my regular readers, but those of you who may be new to the magazine, having taken Wayne up on his excellent subscription offer, may be interested in some of my more mundane announcements. There is a list of reprints from old columns available. The list can be yours for a self-addressed, stamped envelope, sent to me at the address at the head of this column. I am available via E-mail on either CompuServe (ppn 75036,2501) or Delphi (username MARCWA3AJR), and I do try to check into either of these every few days. Feel free to leave questions or comments to me there. If you've read the fine print in this issue you know that it is your duty, if not your obligation, to fill out the Reader Service card and to let those advertisers whose products interest you hear from you, and especially hear that you "Read About It In *73*." Not only that, but your votes and comments on the articles and columns in this issue are important, including your coments on RTTY Loop, to help give the editorial staff the feedback they need to keep *73* the vital magazine that it is.

No one has commented on the "Green Keys" question yet! Next month, I just may have to type a little about it. Who knows? The Shadow? I'll never tell. I guess you'll just have to wait for next month's RTTY Loop! ■

ABOVE AND BEYOND

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HERE WE GO AGAIN

You'd think I'd learned my lesson from Slide Mountain in June of 1985 (see "Just Leave Me Here To Die!" in the November, 1985, issue), but nooooo! I just HAD to climb up another peak for the September VHF QSO Party. And I just HAD to backpack everything in again, including the motorcycle battery. Some people never learn, right?

Well, I actually DID learn something from last year's DXpedition. A few things, to be exact! For starters, I was able to calculate more accurately how much weight I could carry safely, and with that figure in hand could optimize the equipment-to-weight ratio. Another lesson learned from Slide Mountain was to make my ascent in the early morning hours on Sunday, thus avoiding an overnight stay and the attendant camping equipment.

Believe me, once you've tried it, you're hooked but good. This year's expedition originally focused on Overlook Mountain, a 3,150-foot rise on the eastern edge of the Catskill Mountains near Kingston, New York. Overlook Mountain is in grid FN22 and has an excellent shot for about 200 degrees from the north to the southwest—right toward all of the activity on the East Coast.

Trouble was, I had been beaten to the punch by John Lindholm W1XX and his multi-op crew! It seems that John had been "cultivating" this site for some months now, and had finally wrangled permission to run a generator-powered multi-op station with amplifiers and big beams from the New York State Department of Environmental Conservation. John was very helpful in suggesting some alternate locations, however, and I soon decided on a promising site in FN23 called Cathead Mountain.

This would put me considerably further north, but FN23 is a relatively quiet grid and is rare on 432 and 1296 MHz, two bands I had planned on bringing along. It rises 2,425 feet in the southern Adirondacks and is accessible by a 1.25-mile trail (actually a power line right-of-way) which can get pretty steep in places! The paths to the south, east, and west looked very good, so Cathead Mountain it was going to be.

Readers will remember my trouble with my MMT-432/144 transverter last year just prior to the contest. Well, Murphy hit again and it died for good! Frantic calls by myself to ham dealers around the country (those 800 numbers are great, aren't they?) failed to turn up an Echo 70 or Yaesu FT-790. Even used ICOM 490s were unavailable! Ivars Lauzums KC2PX, who runs the PX Shack, placed a call to the Microwave Modules factory in England, wherein another i-f and final board set was located. It would come in on the next British Airways freight flight—hopefully before the contest weekend!

I set about the remainder of the station. The 144-MHz setup was my trusty TR-9000 with its impossible-to-read red LED display and 10 Watts output. The receiver is a bit suspect, so I supplemented it with one of the Microwave Modules rf-switched GaAsFET preamps courtesy of Ivars. 1296 would be run from an SSB Electronics LT-23S driven by the TR-9000. I also located a secondhand IC-502 for 50 MHz, but didn't expect a lot of performance with the 3-Watt output and quarter-wave whip. I wasn't disappointed.

Photo A. The method used to transport the antennas up the mountain. The ripstop nylon bag worked well, as the sharp 1296 elements couldn't poke through. Total pack weight was about 45 pounds.

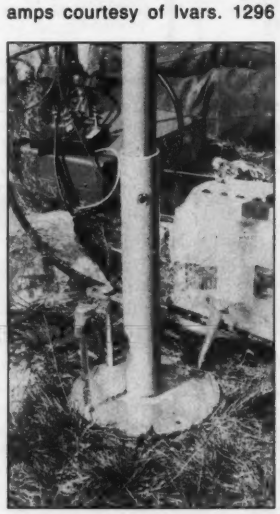

Photo B. The method used to secure the footing of the portable mast arrangement. This saved about 9 pounds from last year's tripod.

220 MHz rounded out the picture with an ICOM IC-3AT barefoot. I figured on making a few contacts on FM and that was indeed the case, as most big contest stations (and not a few smaller ones) are using 223.50 MHz for their 220 contacts.

Antennas were simple: A 4-element KLM 144-MHz beam using a dipole-driven element and a 23-element F9FT Tonna yagi for 1296 MHz. I selected three pieces of 20-gauge generic antenna mast from Lashen Electronics, our local radio emporium. Mike Crawford WA2VUN helped by fabricating a lightweight antenna foot support made from a 7″-diameter piece of aluminum with a 3″ piece of 1-1/4″ pipe welded upright. Four holes were punched around the perimeter for stakes to anchor the antenna support, and the 20-gauge masting slipped over this upright piece. A slip ring and guy ropes provided support for the mast at the 10-foot level.

My brother Miles, who lives in Kingston, New York, and who is an avid outdoorsman, agreed to come along for moral support (he isn't a ham), as well as to investigate the mountain while I was operating. I located the appropriate USGS maps to aid in plotting distances worked and beam headings. We were set to leave from his house and drive north to Great Sacandaga Lake, where we would camp overnight about six miles from the trailhead. This would allow an early start.

Friday came and I was still awaiting news of the shipment from England. Too late! The British Airways flight wouldn't

Photo C. Hard at work in a pileup (well, for a couple minutes, anyway). The 50-MHz rig is set on the calling frequency of 50.110 to listen for any DX call.

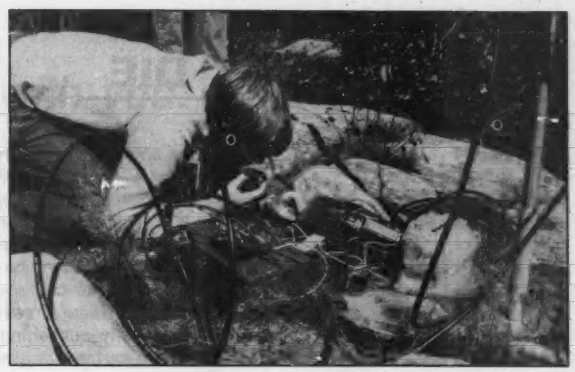

Photo D. This is how to read a red LED display in bright sunlight.

land until 4 p.m. The customs broker estimated it would take about two hours to unload the plane and have everything ready for U.S. Customs agents, which unfortunately would have left an hour earlier at 5 p.m. 432 was out! The silver lining was that my load would be that much lighter.

Saturday afternoon rolled around and I packed the car, departing at 3, an hour into the contest. Much fun was had giving grid squares out on 223.50 MHz FM from the car with my IC-37A. Mike WA2VUN (whose tower you undoubtedly read about last September) was on with a mammoth signal and I was able to track him on 220 FM simplex up the New York Thruway about 30 miles! I also got a big kick out of working W2SZ/1, who must have the strongest 220 signal I've ever heard. I gave them FN21, 32, and 22 during my trip north.

After arriving at the campsite, we plotted our strategy for the next day: Early to rise, a quick breakfast, and off to the trailhead. Of course, we hadn't figured on getting to sleep at 11:30 p.m.! The temperature dropped to below 40 degrees and it was extremely chilly when we arose the next morning at 5:30. A quick meal at the local greasy spoon in Northville and we soon found our way to the trailhead, located at the end of a dirt road.

The photos tell the story best: After taking a half-hour to load up, we set out on the trail which quickly changed from a two-lane grass road to a cleared-out right-of-way for the power lines to the ranger station and fire tower up top. This is a fairly rugged trail, crossing rocks and streams in several places. Due to the "cut swath" of the right-of-way, substantial erosion had occurred and the footing was tricky. After about an hour and 15 minutes, we had reached the top and were greeted by brilliant sunshine as well as 15–20 mph winds.

The antenna masts went together quickly, and the footing plate was installed posthaste, as were the various yagis. Several feedlines were connected, the antennas raised, and we were on the air at 10 a.m.—about an hour later than I had planned. (These things never work on schedule anyway!) Activity was thick on 144.200 and I planted myself about 144.180, looking for the folks back home who had been on for an hour already and probably thought I gave up and went home!

As you might expect, the first stations worked were the big mountaintop multi-operators, such as W2SZ/1 and W1TKZ in FN32 and FN33, respectively. After working a few locals, I heard Mike WA2VUN calling through the QRM and was able to give him his first contact with FN23 on 144 MHz. While working Mike, I was called by VE2DFO in FN25 off the back of the beam for a new multiplier, then WA2SLY in FN30 and KC2PX in FN20. This was a great location! The weather was excellent, and I can't emphasize that enough: Not a cloud for hundreds of square miles that I could see from the mountaintop (and believe me, I could see for hundreds of square miles!).

I also managed to thwart the bad luck on 1296 that had dogged me the past few years: You know—just go to a mountaintop, set up on 23 cm, and it instantly rains. Not this time, although Murphy did nail me on 432 MHz. Stations were pleading with me to go to 70 cm for FN23, and I would have loved to oblige them. Oh, well—next year, guys. W2SZ/1 actually heard my third harmonic on 432 from two meters and tried to work it! That's how good the path was between us. . . line of sight.

1296 operation brought six contacts in four grid squares. I sure was popular, and thought of how nice it would have been to have 10-GHz and 902-MHz equipment. 223.50 brought some more interesting QSOs, including W1VD and WA1STO in Connecticut about 100 miles distant using just the IC-3AT. I also worked my own grid on every band via WA2RQC (thanks, Otto and Doug). 50 MHz was a big flop, mostly due to the lack of a good antenna. But I did bag Steve WB2WIK on what had to be one of his more difficult contacts from FN20. Next year, 10 Watts and a three-element beam. Live and learn!

My last contacts were with John W1XX, who convinced me to come up the mountain in the first place. I worked them quickly on 6, 2, and 1296 and they were LOUD from Overlook Mountain, especially on 23 cm with a S9 +30 signal. What a location that must have been, and I can't wait to see the score they rang up.

I was visited by my stepbrother Peter Peff and his two sons from Bennington during the afternoon, as they came over to check out the climb and watch the festivities as I worked in succession northern Ontario, eastern Pennsylvania, and Cape Cod (FN41) on 2 meters. All too soon it was 2 and Miles was getting antsy, so we struck the set (after a few futile skeds on 1296 with FN43 and 42) with most of the battery power still there.

The grand totals for my effort: 60 QSOs and 28 grid squares in about four hours time. Not bad at all! If I had a decent beam on six meters and a 432 station, that total probably would have been over 100 QSOs and 40 grids for the same time interval. Next year: 10-Watt stations on all bands, plus yagis for each band and a second operator. (Maybe even 902 and 10 GHz!) Possibly even an overnight stay if I can arrange it, but I'll still backpack the stuff up to the site as always. What the heck, I could use the exercise.

Now, I just have to come up with something for the January VHF Sweepstakes. . . . Hmmm, how about cross-country ski portable on 6 and 2 meters from a mountaintop? Now, that would be different! ■

Photo E. A view from the fire tower looking east. The eastern reaches of the Adirondacks can be seen in the background. The White, Green, Catskill, and Berkshire Mountains were visible from the site.

NEVER SAY DIE

from page 14

but which the League did not. Since these are French territories, it's not out of bounds to presume they just might happen to know a bit more about the situation than the League. By the time we added up the countries accepted by all of the IARU societies we had 396. Yep, almost 400 bona fide countries.

396 beats the hell out of 325 or whatever the League is buying these days, so starting in January, 1987, we'll have a new DX country award available from *73*. The award starts with 100 countries, with stickers for 200, 250, 300, 350, 360, 370, 380, 390...and yes, 396. It's not beyond possibility that there'll be a few more added, bringing us over the 400 mark...I hope so. When it comes to working countries, the more the merrier, so why be stingy?

Yes, we want to see the QSL cards confirming the contacts. Hey, remember that I'm not new to this DX award business—I started the WPX award and a bunch more, so don't screw around with any fake cards. One fake card and your name is mud. I work enough DX so I know what's out there and have many of the cards myself, so I can spot ringers. Please try to remember this whole thing is for fun...and what's the fun if you cheat?

In addition to the all-mode award, I'll have special awards for working 100 countries on several modes—two-way RTTY, SSTV, packet, AMTOR, high-speed automated CW, and mobile one way...again with stickers for additional countries. That ought to keep you busy.

All contacts must be made after 0000 UTC, January 1, 1987. I'm planning on running a picture of the first winner of the award on the cover of *73*, so let's see how long it takes. It doesn't take very long for a DXer with the time to whup off a hundred countries—I've done it in a single weekend on SSB. Yes, of course it was during a DX contest, but it still was a big challenge and I made my one-hundredth just minutes before the contest ended. Did it all on 20m sideband.

One time when the band conditions were good I set up a new ham station and got to work on DX. It took me a week to get 100 countries, a month for 200, and a year for 300. That's about par unless you haven't much else to do...a situation I haven't enjoyed since I got into publishing 35 years ago. There's nothing like a monthly publishing deadline to keep you busy the rest of your life.

We'll be publishing the scores in *73* so you'll know what you're up against. Is there any reason I can't ask you to send in computer printouts of your award progress along with your cards?

I suppose I shouldn't mention that I'll have stickers for single-band awards, making it possible for you to get up to 396 countries on as many different bands as you want. The minimum award is for one hundred countries per band. That's duck soup on some bands, but a definite hurdle on 160, for instance.

Will the special mode awards encourage DXpeditions to take along RTTY and other special mode gear? I hope so. It'll also keep 'em busy a few more days as they work 10,000 stations on eight bands with six modes per band. Let's see, that's 480,000 contacts. That could take well over a week. If the DXer works two contacts per minute 24 hours a day, it would take 167 days to get done—that's figuring good propagation all the time. But 10,000 won't even begin to peel off the first layer of Japanese DXers, much less get to the U.S. and Europe. Oh well, look on the bright side, if everyone puts a Green QSL in their envelope you'll be able to retire with a half million dollars. Is there a serious shortage of hams who will work 167 days for a half mil? I can just see the DXpeditions sprouting.

To make your DX hunting a little more fun, I've had the *73* art department put together a world DX map which shows the 396 countries. I always thought the old *Radio* magazine DX map was the best I'd ever seen. It was black and white so I could mark the countries with a colored pencil when I worked 'em. I put 'em in pink when I contact 'em and solid red when the QSL arrives. Those confounded maps in color don't let you show what you've contacted as easily. Map pins aren't as much fun as coloring. Here's where your college course in Map Coloring 202 will stand you in good stead.

How many CBers does it take to hunt elephants? 51. One to carry the guns and 50 for the decoy. That was originally a Polish joke, but I'd rather offend CBers.

Okay?

QSL DESIGN CONTEST

Getting any new project going is usually difficult at best, so I have been hoping we'd not screw up the early customers for our QSLs too badly. Several years ago I converted the garage in our old Pine Street building into a print shop. I put in a couple fair sized presses so I could put out amateur radio books without being a prisoner of a local printer.

"I've done the designs we've used so far, so it's about time for you to take some responsibility. You design our next card."

It takes quite a bit of equipment to do this—plate makers, a couple offset presses, a power paper cutter, a folding machine, an inserter, and a stitcher to put in the staples. I bought everything second- to tenth-hand, so my investment was fairly modest for the print shop I put together.

When I sold everything three years ago all the print shop equipment went with it. Fine, that gave me an opportunity to start over and put together a new print shop using brand new equipment, sparing no expense. My WGE print shop (Peterborough Press) has a large four-color sheet-fed offset press for printing full-color brochures and booklets, a four-color web offset for direct-mail letters, an envelope press, plus the usual bindery equipment—a half-million-dollar investment, all told.

I started printing QSL cards many years ago as a way to keep my book presses busy in between major jobs. I explained in my ads that the prices were low because the QSLs did not have priority on press time. It was a way to provide first-class, yet inexpensive cards, priced so we wouldn't lose too much on the deal. They were a great success.

I had one design with a blue photo of the world taken from space. We were able to print large sheets of these ahead during slack press times. The back of the card had a simple report form—with everything essential for DX-CC credit. It, too, was printed ahead when we had the time to spare. That left only the name and address to be put on the front in black, ganged up 16 at a time. Even when we were busy printing books we were usually able to work in some QSL fronts so orders wouldn't have to wait too long.

The key to keeping QSL prices low is being able to make them in large quantities and to automate as much of the process as possible. By printing two out of the three impressions ahead when the press time was the least expensive we were able to cut costs. By printing them in large sheets instead of one at a time, the way most QSL printers do, again we cut costs.

We set the type on our typesetting system so all we had to do was shoot it into negative form and paste it into the flat, ready to make the printing plate. We'd print the cards 250 at a time, so if someone wanted 500 cards we'd print two cards—1,000 cards meant four at a time. Then, when the printing was dry, we'd cut the cards, box 'em and ship 'em by UPS.

We're using the same system again, with the name, call, and address set by our new computer typesetting system. This one even puts the type in the right position on the card, saving a paste-up step—and a few minutes work.

We started out with some of the same designs I used several years ago—nice cards. We've been getting lots of great letters from readers who've ordered the cards and like 'em. Despite a heavy work load in our print shop we've been getting the cards out in a surprisingly short time. I've explained to my people that when readers order something by mail they somehow expect it to arrive the next day—so if we want repeat business we'd better give the best service we can.

Which brings me to my point—I eventually get around to my point, it's just that I digress a lot. By the way, "a lot" is two words. I don't know how many readers write to me spelling it "alot"—there is no such word. Allot, yes, but that's a different word. Hmmm, another digression! Oh, yes, my point... well, it seems to me it's getting way past time for us to have a new

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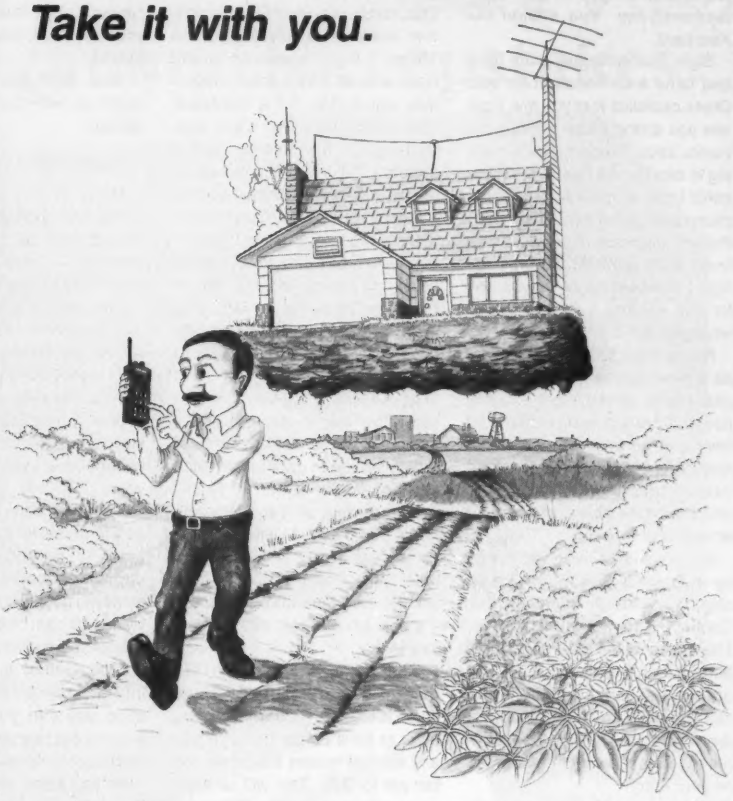

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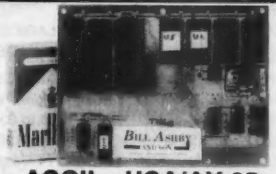
PACKET RADIO



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QSL card design. I've done the designs we've used so far, so it's about time for you to take some responsibility. You design our next card.

Sigh, I suppose just plain glory and fame aren't enough for you. Crass capitalist that you are, I can see you sitting there thinking big bucks. Look, I already said I'm trying to provide the lowest cost QSL cards I can, so get visions of sugar plums out of your mind. No, what I thought might be nice would be a lousy $100 prize for the card design I like best—and maybe $50 for the second best. Let's see what you can do.

Remember, QSL cards have to be a fixed size as required by the post office, so don't get into any poster-sized extravaganzas. The front can be any two colors you like—the back one color. We'll have to print the call and name/address on the front of the card for economical reasons.

Entries should be in my hands by January 31, 1987 (*73* Magazine, QSL Design Contest, WGE Center, Peterborough NH 03458). The quality of the idea is more important than the artwork itself. I've got some superb artists here who can do almost anything. Neatness does count though. Try to remember to put your own name/address on your entry.

Another card I came up with a few years ago had the call in as large letters as possible—the idea being that when hams put your card on their wall it will stand out from all the others. It's a real kick when you see a picture of a DX station and there is your card! The normal small call letters get lost on a shack wall.

When I first got into amateur radio every ham not only had QSL cards, they sent QSLs to confirm every new contact—even on 160m. I think someone would have a heart attack these days if they got a QSL for a two-meter repeater contact. That's sad, really, because it's nice to have a chap's card in your hand when you're talking with him—even if it's over a repeater. Cards are a nice way to keep track of friends.

I remember the time twenty years ago when I visited VK6RU in Perth and he pulled my QSL card out of his file—from a contact twenty years before that! Twenty years! I've got to get down and visit Australia again...that's much too long to stay away. You know, I found an old file of mine—a detailed log of my African safari and around-the-world trip twenty years ago and all the interesting hams and places I visited. I printed some of it in *73* at the time, but most of it never got into print. Should I dig some out and see if it's still fun to read after twenty years?

Getting back to QSLs, with QSL bureaus, much of the postage curse is eased. If you work DX you have to have cards. If you're into any special modes it's pretty rotten not to QSL. This will be even more critical as my new DX award takes hold, with certificates for working countries on automated high-speed CW, RTTY, packet, SSTV, and so on.

One more thing—if you order QSLs from us please be very careful in writing your name, call, and address. If you scribble and we read anything wrong, will you really expect us to make a new batch for nothing? We try to check and recheck, but that won't help if you've made a mess on your order blank.

Now, let's see what you can come up with for a new *73* QSL design.

SOMETHING YOU CAN DO!

Many of you are frustrated about the dwindling number of newcomers to our hobby and have been asking what you can do personally to help the situation.

Our most serious loss has been in the number of youngsters entering the hobby—it's dropped from about 75% to under 15%. Indeed, this loss of youngsters accounts a good deal for the catastrophic drop in new hams we've experienced over the last twenty years.

If we want to get kids interested in hamming we have to reach them—through school radio clubs—and through ham magazines in school libraries. You and your local ham club can sponsor a school radio club and help it get started. Getting a ham magazine into the school library is something you can do personally—a way to help pay your dues to your hobby, so to speak.

While I admit to a slight bias in this, let's look at it practically—if you were going to try and get some kids interested in amateur radio, which ham magazine would you give them to read? Would it be *QST*, with its acres of activity reports? *CQ* with contest news? *HR* with articles on how to build a 10-band all-mode transceiver? Or *73*, which will be running a Novice/Technician license study course? Sure, I loaded the question, but I didn't exaggerate much and you know it.

If you'll sponsor a subscription to *73* for a local school library, I'll go part way with you—making it available at less than our cost—$15 per year in the U.S. That's a 40% discount from the regular $25 subscription price! Here's your chance to get an interesting ham magazine out where the kids will have a chance to read it. This could make it much easier to get school radio clubs going.

I'll do my bit in *73* with plenty of simple construction projects to get 'em started building—articles on every new aspect of our hobby—and a simple technical home-study course in electronics.

For the cost of a dinner you can be a local hero—and your gift just might help some youngster get into amateur radio—and then into electronics or communications as a career. You won't find a cheaper way to have a profound effect on young lives—or to help your hobby.

Amateur radio has provided you with a lot of fun over the years—isn't it time you started helping us attract youngsters in repayment? Please send me the name and address of the school you wish to endow with a subscription to *73* and I'll see they get it with a note that it is a gift from you. At $15 a year, we lose a little money on each subscription, so we're backing you the best we can...without going broke in the process—which would benefit no one. ■

SPECIAL EVENTS

XMASTIME AWARD
DEC 1–31

The Hen House Gang will be sending out the Christmastime Bethlehem and Santa Award during the month of December. Operation is on 10m, 20m, 40m, and Novice CW. For the Santa envelope and fold-up card, send a first-class stamp only; envelopes will be provided. For more information, write to the club president, Robert J. O'Neil W1FHP, Hard Hill Road, Bethlehem CT 06751.

FARIBAULT MN
DEC 6

The annual Handi-Ham Winter Hamfest will be held on December 6 at the Eagles Club in Faribault, Minnesota. Registration begins at 9 a.m. Talk-in on .19/.79. For more information, contact Don Franz WØFIT, 1114 Frank Avenue, Albert Lea MN 56007.

HAZEL PARK MI
DEC 7

The Hazel Park ARC will hold its 21st annual Swap and Shop on December 7 at the Hazel Park High School, 23400 Hughes. North of 9-Mile, west of Dequinder. General admission is $2 in advance, $3 at the door. Children under 11 free. Tables $1 per foot. Talk-in from the 9-Mile and I-75 area on 146.52. For tickets and table reservations, write to HPARC, PO Box 368, Hazel Park MI 48030.

LYNCHBURG 200TH
DEC 13

The Piedmont ARA will operate special-event station AA4UM on December 13 from 8 a.m. to 8 p.m. to celebrate the 200th birthday of the city of Lynchburg, Virginia. From 8 a.m. until noon the frequency will be 3.855, and from noon until 8 p.m. it will be 14.302. For a commemorative certificate, send QSL and an SASE to Piedmont ARA, PO Box 11362, Lynchburg VA 24506.

CLARK COUNTY EVENT
DEC 13–14

The Clark County ARC of Bethlehem, Indiana, will operate W9WWI/9 from 1700 to 0300 UTC on December 13 and from 1300 to 2000 UTC on December 14. Frequencies: 3.905, 7.240, 14.290, 21.365, and 146.25/.85. For a certificate, send a large SASE to CCARC, Box 532, Jeffersonville IN 47131.

CHRISTMAS TOY TEST
DEC 27

The Plano Amateur Radio Klub will operate special-event station WQ5S—"Christmas Toy Test"—from Plano in Collin County, Texas, beginning at 1600 UTC on December 27 and ending 24 hours later. The idea behind this event is to give "new Christmas toy" owners an opportunity to try out their rigs/accessories. Look for station operation on the following bands: the center of the Novice bands ±QRM; the lower 25 kHz of the General phone bands ±QRM; and 146.52, 52.525, and 29.600 MHz FM, along with 144.200 SSB. QSL via Brad Fuller WQ5S, Rte. 11, Box 24, McKinney TX 75069.

MICHIGAN 150TH
JAN 25

The Oakland County ARS will operate W8TNO on January 25, from 1600 to 0000 UTC, to celebrate the 150th anniversary of the state of Michigan. Operation will be on 20 to 80 meters SSB and CW. Suggested frequencies are 14.270, 7.270, 3.870; CW—7.130 and 3.730. For a special certificate, send a 9 x 12 SASE to W8TNO.

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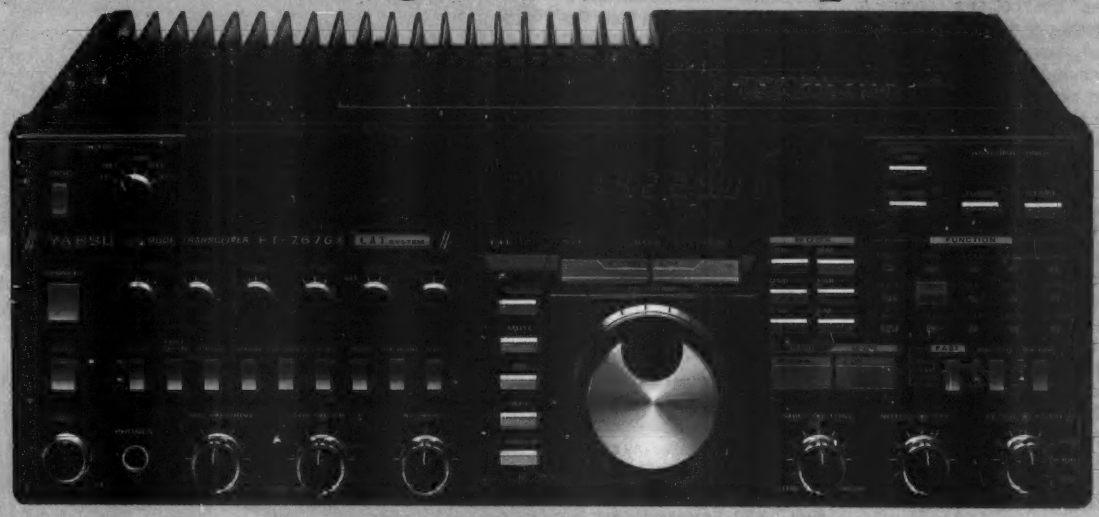

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2. Winner will be selected in a random drawing from among all entries received, under the supervision of the publisher of *73 Amateur Radio*, whose decision will be final. Only one prize will be awarded in this Sweepstakes. Winner will be notified by mail and may be required to execute an affidavit of eligibility and release. Odds of winning will depend on number of entries received. The publisher of *73 Amateur Radio* will arrange delivery of prize. Taxes are the responsibility of the winner. Any manufacturer's warranties will apply, but the publisher makes no warranties with regard to any prizes. Prize is not transferable. No substitution for prize.

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73 INTERNATIONAL

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NOTES FROM FN42

As the holidays approach, greetings fill the air: Merry Christmas! Happy New Year! Happy Chanukah! And to those of you who celebrate these events on December 25th, January 1, and December 27th, respectively, we of *73 Amateur Radio* wish you much merriment, happiness, and reasons to be thankful. Since this is "*73* International," we also extend best wishes for Chanukah to Israel, for Ethiopian Christmas (January 7), Boxing Day (December 26, Canada and Great Britain), Happy New Year's Holiday to Scotland (Jan. 2), Happy Year of the Rabbit to China (year 4624, Jan. 29), and Happy Independence Day to Bahrain (Dec. 16), Burma (Jan. 4), and Nauru (Jan. 31). Apologies to any whose nation has a major holiday not listed here; we could only do our best. When you work 4X or 4Z, ET, VE, G, B, A9, XZ, or C2 on or near the appropriate days, send your best wishes, too. Be the first non-Bahraini to send special greetings for December 16. . . you'll probably be given the keys to Manama—and maybe a temporary license to operate, and A92BW will have to take back his words, "There is absolutely *no chance* of visitors obtaining a license. . . . " Stranger things have happened as results of friendly, thoughtful greetings.

It isn't too late to wish a happy 80th anniversary of its sovereignty to Liechtenstein, either. . . see news about HB0 below.

AUSTRALIA

J. E. Joyce VK3YJ
44 Wren Street
Altona 3018
Victoria
Australia

FOR SALE—OR WANTED

The DOC has approved VK3's proposed advertising of amateur radio equipment for sale or wanted on the weekly WIA Sunday broadcasts. VK3 now joins VK5 and VK6, which have similar activity. It will be strictly controlled: no prices to be used, and all adverts must be screened competently. Des Clarke VK3DES,State Secretary, has taken on the task. Requests must go to him in the VK3 Division office by each Thursday; if approved they are aired Sunday, and any interested listener can contact him and receive the phone number of the person who placed the ad.

The Sunday broadcast is transmitted over several bands simultaneously and thus covers much of Australia, New Zealand, and some Pacific islands (propagation permitting).

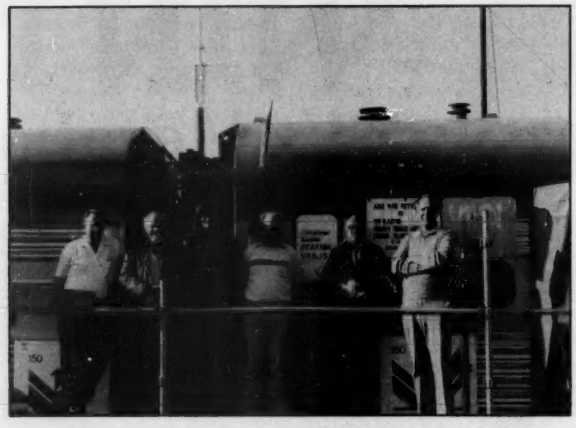
TRAINS AND AMATEURS

I did not realize how popular amateur radio was with railway workers or enthusiasts until the feedback started after my column on "VK5 Amateurs Go Rail Mobile" [*73* International, March and April, 1986]. I received many letters from various countries and, from Heinze DJ3UN, even an international callbook of amateurs belonging to FIRAC (Federation Internationale des Radioamateurs–Cheminots). So: here is more on the subject, from Graham Horlin-Smith VK5AQZ, J150/Amateur Radio Celebration's coordinator.

WHISTLE STOPS WITH AMATEUR RADIO

VK5JSA's most recent activity has been to work from the Jubilee Industry Trade Train, which enjoyed a three-month successful run, presenting amateur radio and news of South Australia's Jubilee Year to community groups, amateurs throughout Australia, and the lucky DX stations that were able to catch it.

The travelling showplace consisted of nine diesel-hauled modern carriages including (1) a VIP entertainment car, (2) a power-equipped carriage to supply the total requirements of the train at 20 different whistle stops, plus a week at the beginning and in Adelaide at the end, and (3) a Communications Centre breakvan (15′ x 9′) at the end of Carriage Seven (home for the VK5JSA S.A. radio amateur volunteers for the three-month trip), with space for static displays of amateur radio materials, HF and 2-metre stations, two operators, and a stream of visitors.



The Wallaroo whistle-stop ops. From the left: Doug VK5NIY, John VK5BL, Andy VK5NTT, Wally VK5NWA, Norm VK5HL, and Lloyd VK5LL. "Wallaroo" is the aboriginal word for. . . well, discreetly ask the next Aussie you meet. (Photo by VK5NTT)

Russell VK5KAK, Geoff VK5PXK, and Ron VK5ARC, Noarlunga Centre amateurs. (Photo by Graham VK5AQZ)

Among a distinguished group of volunteers and workers were several whose solo efforts are worth a mention. Jack VK5FV was our Man Friday who slipped out of Adelaide to activate the station at Lameroo (with Les VK5LH) and at Burra. Terry VK5ATN looked after Balaklava and Riverton. The displays were professionally accomplished by Peter Koen (the display engineer of the Trans Australian, "Live Across The Nullarbor"). And at each whistle stop a team of fresh, local amateurs took over VK5JSA/Portable, which resembled a sort of radio marathon across VK5-land (which is 1-1/2 Texas' size).

Activating VK5JSA at each stop meant installing a pre-set five-band trapped vertical, which was clamped to an external passenger handrail and swung outwards, allowing about a two-foot clearance from the train. The use of the 2-metre rig depended on the proximity of the nearest repeater.

•Over 5,000 contacts were logged, with a high percentage of Jubilee 150 QSLs confirming the Trade Train contact.

•Propagation limitations made contacts on 20, 15, and 10 metres difficult—as did some operating locations.

•VK5JSA was well received nightly on 80 metres by Australian stations calling in, and the J150 nets were further boosted whenever the Trade Train appeared on the net frequency.

•The three-month program for VK5JSA enabled stations to catch the train and collect points for the Jubilee 150 Award, with VK5JSA and VK5 contacts. As of July 1st, the Jubilee callsign changed to V15JSA, and DX stations were invited to qualify for the award as follows: one contact with V15JSA *or* five with V15s for the Bronze Award, one with V15JSA *plus* five with V15s for the Silver Award, and, for the Gold Award, by meeting the qualifications published (or to be published) in American amateur radio magazines.

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NOTE: Australian and DX recipients of J150 Awards have been made "Honorary VK5s" to assist other DX stations to qualify for the award. (Certificated stations are worth 15, 30, or 50 points, plus band points, for triple-certificate holders, towards the 150 points needed for the very popular South Australian Award.)

There now is a rumor that we might even put V15JSA on board a Formula 1 racing car in this month's [October] "Grand Prix," from the Adelaide circuit!

AUSSIE YLs

Without doubt, two ladies stand out as amateur radio pioneers, particularly within VK.

The first was Mrs. Florence McKenzie VK2FV, first licensed as 2GA in 1921. "Mrs. Mac" was known to countless thousands of American and other Allied servicemen during WWII due to the Morse code lessons she gave in Sydney (VK2) during that trying period. A Silent Key since 1982, her memory is perpetuated by The Florence McKenzie Award instigated by the ladies of ALARA (Australian Ladies' Amateur Radio Association).

The second OOT/YL is Austine VK3YL, the first YL into the Royal Australian Airforce Reserves and the only Australian YL to achieve the DXCC honor roll. She also is remembered for performing a similar service as CW instructor, but in Melbourne (VK3). She is the oldest registered member of the WIA, with more than 54 years of continuous membership.

Of latter days, two ladies come to mind as outstanding contributors to our hobby, Heather VK2HD and Jenny VK5ANW. VK2HD is a regular net controller on 14.220 at 0600 UTC, and was recently appointed as a director of the YASME Foundation managing board. Jenny is the State Representative of, and Australian Secretary of, ALARA, and also is State Secretary of the WIA.

In a future column I will tell you more about ALARA, which is worldwide with a membership of around 200. Meanwhile, if you are interested in joining, write the ALARA Treasurer, PO Box 4, Middle Brighton, Australia 3186; listen in to members of YL clubs around the world meeting on the sixth of each month, on the hour (with 0400 UTC and on being most popular): *Phone:* 3.588, 14.288, 21.188, 21.388, 28.588, 28.688 *CW:* 3.530, 14.058, 21.058, 21.133, 28.058, 28.133.

BRAZIL

Gerson Rissin PY1APS/PY7APS
PO Box 12178, Copacabana
20000 Rio de Janeiro, RJ
Brazil

Carlos Vianna Carneiro PYICC
Afonso Pena, 49/701
20270 Rio de Janeiro
Brazil

TRINDADE ISLAND

Trindade Island, Fernando de Noronha, and St. Peter & St. Paul Rocks are three rare spots that belong to Brazil, but due to their distances from the coast they count as separate countries for the DXCC award. So every DXpedition to those islands is an eagerly anticipated event. Each time, many friends are able to work a new one or sometimes a new country on a particular band or mode. It was the same during the last DXpedition to Trindade Island.

The Brazilian navy supplies the island every two months and usually authorizes the trip of one or two amateurs. This time, Claudio PY1DFF and Ric PY1VOY were ready to go after making a few arrangements. First they got a four-band vertical antenna, model DXV-4, from Electril, two more verticals for 20 and 15 metres, and a longwire for 80 and 160.

After five days, the ship finally arrived off Trindade Island. Immediately, the ship commander ordered the helicopter to land the people and equipment. The DX team decided to stay in the Meteorological Station, and within 15 minutes the DXV-4 was up and ready.

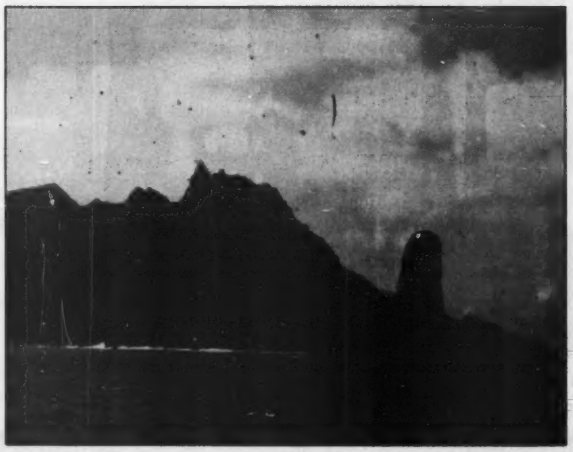
After the very first QSO, the pileup was tremendous, and the operators took turns operating during the entire day in spite of poor propagation on the high bands. At night the conditions were excellent for Europe, Asia, and North America on the 7-MHz band. During the split-time operation on 7.001, the pileup was very strong between 7.003 and 7.010. At 0700 UTC in the ZL2AAG net, it is possible to work many Pacific-area stations.

After 16 hours, 1,285 stations were worked, most of them on 40. (QSL information: PO Box 90415, 25600 Petropolis, RJ, Brazil.)

PY1DFF/PY0T and PY1VOY/PY0 are grateful to the Brazilian Navy and the commander of the *Gracia Aranha* for making their DXpedition possible.

de PY1APS/PY7APS

The DXpedition team: Claudio (left) and Ric.



Trindade Island.

Dulce PY1BUL receives GPCW winner's trophy from GPCW manager, PY1JN.

WORLD'S 1ST EHSC YL

Several CW high-speed clubs exist, like the famous FOC (Finest Operators Club), like TOPS, and like the HSC series: High Speed Club, Very High Speed Club (VHSC), Super High Speed Club (SHSC), and Extremely High Speed Club (EHSC). Membership in each requires a 30-minute operating period (normal conversation) receiving and sending at 25 to 30 wpm for the first category, 40 wpm for the second, 50 wpm for the third, and 60 wpm for the EHSC level. No computers, decodifiers, or keyboards are allowed during any operating. Five HSC members must QSL the candidate for HSC membership, four VHSC QSLs are needed for that level, three for SHSC candidates, and two sponsors are required for EHSC.

Brazilian YL Dulce PY1BUL became the 1,370th member of HSC, the 213th of VHSC—and the 3rd YL in the world—the 88th of SHSC (and the second YL), and member #46 and the *first* YL member of EHSC. Hers is also the first Brazilian station to earn that honor! If you would like to chat with Dulce, you may do so in English, French, German, Italian, Portuguese, or Spanish!

We are proud of our PY1BUL! And according to her, pretty soon we will have another Brazilian EHSC member—Alex PR7PO. (He and Harold PY1ZAE are the only active Brazilian members of the FOC at this time.)

de PY1CC

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GREAT BRITAIN

Jeff Maynard G4EJA
32 Waldorf Heights
Hawley Hill
Camberley GU17 9JQ
England

The involvement that the RSGB (Radio Society of Great Britain) has in the affairs of amateur radio in the UK never ceases to amaze me. Not that I would like any *73* subscribers to read anything derogatory into that remark. The RSGB does a very good job and represents UK amateurs very, very well. Witness just two recent RSGB successes—the opening of 50 MHz and the opening of Morse on the air to Class B (VHF only) operation.

No, what amazes me is the extent to which RSGB is involved with all aspects of amateur radio—technical, regulatory, operating, awards, representation on official bodies, and many more. Among RSGB's specific activities: rally organization, special-event callsign allocation, publication of *Rad Com*, slow Morse transmissions, beacons and repeaters, GB2RS news broadcasts, film and tape library, QSL Bureau, reciprocal licensing, equipment insurance, intruder watch, and propagation studies.

All of this is in addition to the general promotion of amateur radio as envisioned by the society's objectives (my paraphrasing):

•To promote the general advancement of the science and practice of radio communications.

•To facilitate the exchange of ideas and information on the subjects amongst members and others.

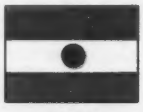
•To obtain the maximum freedom of action for amateurs consistent with safeguarding the interests of all concerned.

The affairs of the society are organized and directed by its Council, chaired by the president and including the immediate past president, the executive vice-president (who becomes president in the following year), the "Honorary Treasurer" (responsible for the all-important funds), and up to 15 members elected annually by postal balloting amongst all voting members of the society.

A society like the RSGB exists both to serve and be served by its members. This necessitates a continuing *two-way* flow of information, ideas, and opinions. Some 20 Regional Representatives interface between the Council and more than 100 Area Representatives. Their areas of responsibility may be as large geographically as northern Scotland or as large numerically as Greater London. The area representatives look after smaller geographic areas containing up to 20 or so different local radio clubs; they are the ones who best know and understand views at the grass-roots level, often being current or past officers of a local club.

A significant element of the work of the society is entrusted to its 16 standing committees and its management group. These are on: Education, Electromagnetic Compatibility, Finance and Staff, Exhibition and Rally, HF, HF Contests, IARU, Licensing Advisory, Membership and Representation, Microwave, Propagation Studies, Raynet, Repeater Management, Technical and Publications, VHF, and VHF Contests. Attached to the committees are a number of Honorary Officers charged with coordinating or managing particular aspects of the society's work.

All of these posts are voluntary, of course, as are the society's representatives on seven British Standards Institute committees and five CCIR study groups. It is the continuing desire of so many to offer their time and energy to help the society achieve its objectives that is in no small part responsible for the excellent state of and high regard for amateur radio in the UK.



INDIA

Ajitaprasad Ramesh VU2RAH/W7
1025 E. Orange, G25A
Tempe AZ 85281

GARDEN CITY CONTEST

The Bangalore Amateur Radio Club (BARC) and the Vivesvaraya Industrial & Technical Museum (Bangalore) announce the 1986 Garden City Contest on CW (between 1200 UTC Saturday, December 13 and 1200 UTC Sunday, December 14) and phone (1200 UTC Saturday, December 20 and 1200 UTC Sunday, December 21).

•There is no entry fee. Open to all licensed amateurs worldwide; single operator only, power and frequency restrictions as per stipulations in the contestant's license.

•80, 40, 20, 15, 10 meters; contact may be made with the same station once in each band.

•Exchange: Complete RST report and contact number in three or more digits—e.g., if VU2ABC is your first contact, your report would be 599001; if VU2XYZ is your 20th contact, your report would be 559020.

•Entry classes: A for VU2s with Grade 1 license; B for VU2s with Grade 2 license; no designation for all non-VU2 hams.

•Points: For VU2s, complete contacts, Asia, including India, 1 point; Europe, Africa, Australia, 2; North and South America, 3. For DX stations, Asian, 1 point for every VU2 contact; 2 points for European, African, and Australian stations; 3 points for stations in North and South America.

Entries must be postmarked January 15, 1987 or before, and addressed to The Convenor, Garden City Contest 1986, Bangalore Amateur Radio Club, PO Box 5053, Bangalore 560001, India.

Winning certificates will be awarded the three top scorers in each class; all contestants submitting logs will receive certificates of participation, also (n−1)th place winner will be awarded in each group (where n is the total number of entries received).

Rulings of the contest committee (nominated members of BARC and VITM) will be binding and final; contest not open to employees of the National Council of Science Museums or BARC members who receive, scrutinize, and evaluate entries, and recommend the awards.

For further information, write VU2RAH/W7 at above Arizona address or phone him at (602)-921-0145.

LIECHTENSTEIN

Guenther Erich Holzknecht
HBØCZS, Secretary
Liechtenstein Amateur Radio Association
PO Box 103, FL-9493 Mauren
Principality of Liechtenstein

The Liechtenstein Amateur Radio Association (LARA) has been formed for the hams and SWLs of the Principality, and IARU membership has been applied for. Until now, Swiss operators have determined amateur activity in the country and could change their HB9 calls into HBØ calls when visiting. One result was that as many as 200 HBØ stations were on the air during a single weekend. From now on, all non-Liechtensteiners must put HBØ in front of their own callsigns.

There are 11 resident operators in Liechtenstein, five with shortwave licenses, and they are active on all bands. There is a club station (HBØFL—the FL standing for Furstentum Liechtenstein), a repeater has been set up, and LARA has established the 1.Liechtenstein Award. "We like QSLing and enjoy DXing as well as rag-chewing. For us it's always a pleasure to talk to Americans and we hope to meet as many operators [from there] as possible."

Thanks to George Baustert AA4VB, VP, Florida Westcoast DX Ring, for this information.

NEW ZEALAND

D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

I have been absent from these pages since June holidaying in the U.S. and Canada. We are very lucky people, belonging to such an international fraternity as amateur radio. Everywhere I went I was immediately among friends. The hospitality was overwhelming.

I have many happy and memorable times to look back on, from the Irish KA6 I worked pedestrian mobile in Victoria, B.C., who was sure he knew me (he reads this column—at least I have one reader!), the Hamfest group at Jackson's Mill, West Virginia, the Prince Edward Island gang and the breakfast meeting, the Amsterdam [New York] stopover with a ham family (Mum, Dad, and all three daughters are hams) and the visit they took me on to the Antique Wireless Association Museum where I met the curator, Bruce W2ICE, and all the others I met for an "eyeball" or on-air QSO. I even visited the Doghouse Restaurant in Seattle, where a back room is reserved for ham operators to have their lunch away

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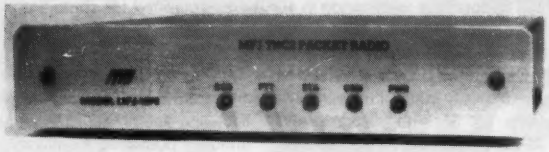

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from the main eating room, and met some of the local amateurs.

I was especially fortunate to meet with Wayne W2NSD (and his two beautiful greyhounds), managing editor Chris KA1MPL, and many of the *73* staff when I stopped over in Hancock, which is a delightful New Hampshire town. What a marvelous environment to have as a work place! It must be a pleasure to go to work each day! [*We enjoyed having you visit us! Come again! —International Editor*]

Another experience to be remembered was the chance to assist at the EXPO Amateur Station and Display in Canada Place, in Vancouver. Unfortunately, only my host, Jack VE7CMD, and I were there for the Friday evening 5–10 p.m. period, and we were so busy answering visitors' questions that there was little time to operate VE7EXPO, but at least I did log a couple of contacts on two meters. The VE7EXPO QSL card is a wonderful memento of this occasion.

While in Vancouver I had the use of VE7CMD's equipment and logged many fine QSOs, finished off my Worked All States portable VE7, and now await QSLs only from North Dakota, Rhode Island, and Wyoming to place my application for the award.

I must also mention the assistance I received from some of the great nets operating in North America: the YL Net, the Century Club Net, and the Rocky Mountain (Hi Noon) Net, just to name three. All net controllers made me very welcome, helped me when they could, and made my days on the air much more enjoyable and memorable.

NZART'S 60TH

Much went on while I was away and it was still going on when I returned. August 16th was the 60th anniversary of The New Zealand Association of Radio Transmitters; the still-active Tom Clarkson was honored as a founder member and received a plaque from NZART President Terry Carrel ZL3QL; a special callsign has been allocated to NZART's HQ station, ZL6A, which will be operating on all bands (conditions permitting)—and there will be a special QSL card; and a Harkness Fellowship has been awarded to Dr. Murray Milner ZL2LB to study for up to two years in the U.S. and bring back knowledge and experience to help in the planning of New Zealand satellite communications.

Radio masts and antennae and town planning were also to the fore during my holiday absence and another favourable decision made . . . I attended a forum on this subject while in the States so it is apparent that the problem is worldwide; we must be constantly vigilant when town planning and amateur radio matters are being discussed to see that our rights are defended.

In my next column I will cover our new Radio Regulations, which became effective in July after two years of consideration by ZL amateurs, with whom our regulatory body, the New Zealand Post Office, kept in touch.

POLAND

Jerzy Szymczak
78–200 Bialogard
Buczka 2/3
Poland

Jurek Prajsner SP5NZ/MM travelled with the Polish passenger vessel *Stefan Batory* on a Caribbean voyage from February 13 to March 20. He used FT-790R and FT-290 Yaesu transceivers with 30-W amplifiers, and attached yagis to a bulwark rail, 12 element for the 70-cm band and 5 element for 2 metres, with a 7-metre antenna feeder cable. It was difficult to establish contact with Caribbean region hams for converters there work on 146–147 MHz, and most hams there speak only Spanish. SP5NZP/MM signals made a hit off the coast of Great Britain and BRD through 70-cm converters, too. He made 40 QSLs through OSCAR 10 when outside the range of local stations. His most interesting communications were with "KA1MLN—operator Ester from Boston, W1QXX—operator Jack, LU8EBH—operator Col, and CT3BI—operator Jose."

The ham student club SP9PDF from Gliwice went to the Aland Islands in 1984 [*see Sweden column for more Aland activity*]. SP6LHI, SP6BGB, and SP9FIH operated at 20° longitude and 60° latitude with FT-101Z and antenna W3DZZ. On July 24th at 2100 UTC they began to call on 14.195 MHz and other bands using antennas 14 AVQ, TH3MK3, and 402 BA. On weekends they repeatedly exceeded 130 QSOs per hour; 7,100 contacts with stations in 116 countries were made in 10 days, including 720 QSOs with Poland. Solar activity held contacts with the U.S. to 75; 250 with Japan. They made a hit with contacts on 80 with ZP5JAL and AP2SA. They much appreciated the hospitality they received from Finnish hams.

Polish DX Contest winners (countries confirmed/accepted countries), CW: SP6RT 314/334; Phone: SP9VU 312/324; Mixed: SP7HT 316/339. There are some rule changes for the SPDX Contest for April, 1987 (SSB; the contest is CW in even-numbered years), which will be published here next time.

SWEDEN

Rune Wande SMØCOP
Frejavagen 10
S–155 00 Nykvarn
Sweden

Enthusiastic and active YLs in Finland and Sweden arranged a DH/SM YL meeting on "neutral soil" last May. Raija SMØHNV/OH1RL, who has been to YL meetings around the world, decided it would be great to have an annual Scandinavian YL get-together, and with the Finnish YL group, organized the first one on the island of Aland—OHØ-land. [Aland is a group of islands in the Gulf of Bothnia—an autonomous department, 25 miles from Sweden and 15 from the Finnish mainland.]

Lars OHØRJ kindly lent his FT-757GX and a multiband dipole, and arranged for the club call—OHØAB (Anna Bella) to be used. Several hundred QSOs were made despite the beautiful weather; such a prefix used by YL operators stirred up quite a pileup, which was handled efficiently.

Other events included a transformer-throwing contest won by Eeva OH3ST. A small group of accompanying OMs were allowed to participate, and "the OH hams won thanks to superior transformer-handling technique and the famous Finnish SISU (stamina)." [Opinions expressed by correspondents for *73* International are not necessarily those of the magazine, which does not want to start a war—and the International Editor once knew a Swede from Karlskrona who . . . but that's another story.] Next year the meeting is planned for some place in Sweden.

NEW SWEDISH CALLBOOK

Up to the late 70s the Swedish licensing authority, Televerket, annually published a callbook including all amateurs in Sweden and sent it free of charge to all license holders. Then suddenly it ceased to come and no explanation was given, but we were promised a new book, every year. After five years and no callbook, Tage SM6GDL started to publish *Tage's List*, a callbook he must have spent a fortune on phone calls to keep up to date—a tremendous job; it seems that hams are changing QTHs more often than average people. He included repeater maps, the DXCC list, antenna-construction articles, and other valuable things in his book—which recently was renamed *The Amateur Radio Guide*.

Much to everybody's surprise this summer, every licensed ham in Sweden received, free, a new SM callbook from Televerket, including a name and QTH index which is very useful. It now will be published annually and can be subscribed to for 40 Swedish kroner (about US $6) or about half the price of Tage's book. Single copies are 60 Sw. kroner. It is called *Amatorradioforteckning E:22* and may be ordered from Televerket Radio, RFT, S-123 86 Farsta, Sweden.

SWITZERLAND

Heinz Mueller HB9BOS
PO Box 119
CH-4144 Arlesheim
Switzerland

DIG Schweiz (Diploma Interests Group, Switzerland) was formed last September by HB9BNQ, HB9DDZ, and HB9BOS, as a section of DIG Germany. The club station is HB9DIG (and counts three points toward the DIG Member Award). The group was formed on the basis of an opinion survey which resulted in an expression of favor by 50% of those participating. Purposes of the group include fostering greater activity, better discipline on the air, and courtesy on all amateur wireless bands. ■

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A VOX In A Box	K1NYK	endless-loop CQer	Dec 34
Agc, PDQ	KX6E	simple add-on agc	May 66
Antennas Should Be Heard, Not Seen	KC3HW	2m hidden J-pole	Apr 42
Born-Again Bargain Boards	Thompson	use surplus PC boards	Nov 30
Build A Digital IC Trainer	WB4YOD/PW8ZAF	for the experimenter	Mar 40
Build a Dynamic Duo	VE1VQ	speaker/mike and 12-V adapter for your HT	Feb 40
CoCo's Compu-Charger	K2OAW	world's smartest NiCd conditioner	Sep 70
Commodore's RTTY Riot	W8CHK, WB8YOB	put your C-64 on RTTY	Nov 34
Computer Rotor Control	WB2UVU	automatic beam pointing	Jun 64
Connect Alarm!	K7YZZ	one-hour u-build-it	Aug 66
Defuse RFI	W8WUZ	the coaxial ground revisited	Nov 32
Dishing It Out On 10 GHz	WB6IGP	microwave feeds and antennas	Sep 46
Don't Be A Kamikaze!	KA4J	improvement on the suicide cord	Mar 30
Double Your Computing Power!	NO8M	add a second keyboard to your CoCo	Jan 50
Faster Than A Patch, It's Speed Dialer	K7UKW	one-button autodialer	Mar 20
Get Organized Today With Argo's Helper	W3BYM	do-all black box for QRP stations	Mar 44
HF Antennas: All Bands, All Wire	W8VM	three 9-band doublets	Sep 32
Halt That Hum!	WA4WDL	filter for 60-Hz hum	Mar 17
High and Dry	WA2OLZ	simple beam mounting	Sep 50
Inside CoCo's ROMpak	WB8IKO	store your programs in ROM	Mar 36
Just the FAX, Ma'am	WB8TPD	one-chip WEFAX decoder for the C-64	Oct 24
Kit Corner: the DSE Radio Direction Finder	Swain	Australian RDFing	Jul 64
Make The Switch	WB2JJX	add WARC bands to your boat anchor	Dec 26
Malley's Manchester Monitor	K1NYK	monitor your transmitted audio	Apr 66
Messing With Microwaves	Neal	construction techniques	Jun 52
Microwave Building Blocks: The I-f Amplifier	WB6IGP	one tiny chip does it all	Oct 42
Narrow-Minded Filtering	WA3IAC	one-chip switched cap filter	Dec 48
One Band, One Transistor	WB2EUF	quick and dirty pocket receiver	Oct 54
Precision Packet Tuning	WB2OSZ	world's best packet/RTTY tuning indicator	Aug 40
Radio to Go	WB8WPY	inexpensive VOX headset	May 66
Razor-Sharp CW	N6HI	is an 80-Hz filter too wide?	Feb 10
Remote-Controlled Everything	WB6VYN	home-brew a remote control system	May 70
Resonant Wire Antennas	W8VM	random-length wires	Sep 60
Rock Solid Rf	Ociepka	PLL-based frequency synthesizer	Apr 74
Roll A RTTY Scope	WA8MRG	tuning indicator with built-in CRT	Jul 28
Run Silent, Run Beep	PY2AUC	scan indicator for the FT-227RB	Jan 40
Scaling the Wet Noodle	W5RRH	modeling low-band antennas	Sep 40
Salcal and State Machines	WA7NBF	state machine tutorial	Jan 26
Shoestring Shortwave	K1CLL	simple shortwave receive converter	Oct 34
Speed-Charge Your PB-21	WA8IZV	fast charger for the TH-21	May 32
Split That Audio!	K1NYK	dual-port audio amp for contesters	Dec 38
Stacked Vee-Beam Arrays	W6TYH	15-meter blockbuster	Apr 32
Stretch the GP Antenna to the Max	GW3SBG/G3SB	simplest of all antennas	Apr 27
Subaudible Snooping	KE6VK	very-low-frequency counter	Nov 48
Super-Selectable Bandpass Filters	PA0SE	the ultimate i-f filter	Feb 54
The 75m Laid-Back Quad	N4VD	it started out as a joke	Sep 66
The Basics of Computer CW	W9OOK	VIC-20 program and hardware	Apr 59
The Care & Feeding of a Curved Linear Array Antenna System	N8BIS	all-band trailer installation	Apr 30
The Commodore Cable Caper	KE4PC	home-brew a printer cable	Jan 44
The DXer's SCF	NB9K	the ultimate switched cap filter	Oct 46
The Hula Hoop Loop Revisited	W6QIF	deep nulls for the low bands	May 42
The Lazy U Dipole	VE7BS	bending an HF dipole	Sep 64
The Missing Link	WB2REM	HT control of your HF station	Sep 42
The Perfect RTTY Filter	WA8MRG	less than $10	Jan 46
The Piggy-Bank Patch	KT2B	autopatch for the Piggy-Bank repeator	Jul 40
The Potabilities Are Endless!	KA7AWD	how to pot a project	Apr 57
The Ramada Radiator	WA8WVF	$10 all-band portable antenna	Sep 52
The Texas Tango Antenna	K5BTV	tuned coaxial-stub dipole	Sep 54
Total Solar	WB8VGE	turn sunshine into sine waves	May 60
Transistors On The Bias	W6WTU	how to bias transistor amps	Nov 40
Transmitter Hunters: Here's Your Ammo For Tracking	WB8CMC	ultra-sensitive 2m fox-hunter	May 50
Trap An Amazon Aerial	WB4YOD/PW8ZAF	home-brew your own traps	Sep 56
Try an Inverted-Psi Wire	W1GV/4	hot 80m DX antenna	Jan 22
Two to Ten	WB6IPM	transceiving converter	Jun 38
Up, Down, and All Around	WA2AXO	scanning for the KDK 2016A	Feb 36
What You See Is Where You're At: Part II	WA8YKN	universal digital frequency display	May 54
Working 2ICTU	WB8OMK	two-chip RTTY TU	Jan 54
Yesterday's Circuits Today	W6HDM	favorite tube circuits	Feb 28
Your Bridge Over Troubled Antenna Tuning	W3MT	matching box	Apr 24
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A VOX In A Box	K1NYK	endless-loop CQer	Dec 34
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They Threw What Away?	WA8WTE	surplus UHF swr bridges	Jun 58
Transmitter Hunters: Here's Your Ammo For Tracking	WB8CMC	ultra-sensitive 2m fox-hunter	May 50
What You See Is Where You're At: Part II	WA8YKN	universal digital frequency display	May 54
Gadgets			
Army Surplus CW	W8MFL, WL7AKZ	the Special Forces PRC-64	May 36
Curious About Code?	Lewart	TRS-80 code teacher	Feb 60
Get With the Program and Speed Up Your Code	KA2QOU	for the Apple computer	Apr 54
Narrow-Minded Filtering	WA3IAC	one-chip switched cap filter	Dec 48
Razor-Sharp CW	N6HI	is an 80-Hz filter too wide?	Feb 10
The Basics of Computer CW	W9OOK	VIC-20 program and hardware	Apr 59
The DXer's SCF	NB9K	the ultimate switched cap filter	Oct 46
I/O			
C-64 S-s-s-tutter Fix	WA4BLC	sure cure for keybounce	Jul 70
Commodore's RTTY Riot	W8CHK, WB8YOB	put your C-64 on RTTY	Nov 34
Computer Rotor Control	WB2UVU	automatic beam pointing	Jun 64
Curious About Code?	Lewart	TRS-80 code teacher	Feb 60
Double Your Computing Power!	NO8M	add a second keyboard to your CoCo	Jan 50
Get With the Program and Speed Up Your Code	KA2QOU	for the Apple computer	Apr 54
Inside CoCo's ROMpak	WB8IKO	store your programs in ROM	Mar 36
Just the FAX, Ma'am	WB8TPD	one-chip WEFAX decoder for the C-64	Oct 24
More Cheap Talk	WB6NQK	text-to-speech algorithm for your computer	Jan 12
Terminal Teletype	W3RWU	RTTY for the H-89	Apr 62
The Basics of Computer CW	W9OOK	VIC-20 program and hardware	Apr 59
The Commodore Cable Caper	KE4PC	home-brew a printer cable	Jan 44
The Perfect RTTY Filter	WA8MRG	less than $10	Jan 46
Transistors On The Bias	W6WTU	how to bias transistor amps	Nov 40
VIC RAMification: Part III	W6LOB	more RAM for your VIC-20	Feb 26
Watts My Line	K4IPV	Basic transmission line design program	Sep 36
Working 2ICTU	WB8OMK	two-chip RTTY TU	Jan 54
73's Annual Holiday Shopping Guide	Staff	gifts for hams	Nov 54
Miscellaneous			
A Packet Primer	W1BEL	the mechanics of packet	Aug 28
A Simple Way to Measure SSB PEP	W5VSR	use a little common sense	Oct 40
A Walk Through the VHF/UHF Spectrum	KT2B	a guided tour	Jun 26
Administering the Novice Exam	WF8P	how to do it	Jul 56
Are Sine Waves Sacred?	W6HDM	the benefits of trapezoidal power	May 44
Born-Again Bargain Boards	Thompson	use surplus PC boards	Nov 30
Bozo And the B-Hunt	WD6R	fun for your club	Jul 36
Dayton '86	Staff	the Hamvention in pictures	Jul 18
Defuse RFI	W8WUZ	the coaxial ground revisited	Nov 32
Digital Simplex Repeaters	K4YKZ	a cross between packet radio and repeaters	Jun 48
Everybody Equalize!	K9EID	optimizing microphone response	Dec 44
Future Hams of America	Azzalina	8,000 people meet ham radio	Jul 44
Genius Brings Home the Bacon	Phenix	the Mobius antenna takes on a new twist	Jul 52
HAMS Against Drunk Driving	KB8HQS	something your club can do	Jul 38
Hams In Space	KW1O	W5LFL and W8ORE talk about their flights	Jun 34

How To Build A Great Ham Club	W2NSD/1	advice from Wayne	Jul 26
Instruction Instructions	N6HYK	what's missing from them	Mar 50
Japan's Hush-Hush Rushbox	PA0SE	secret radio from WWII	Mar 9
Lightning Never Strikes	W6WUZ	practical lightning protection	Aug 79
Little or No Resistance	AJ6N	mysterious world of superconduction	Jan 36
Lousy Inconsiderate Dummies	W2NSD/1	lids we love to hate	May 28
Make the Switch to PIN Diodes	OA4KO/YV5	replace relays with silent diodes	Oct 28
No Free Lunches	W6HDM	perpetual motion update	Nov 42
Nobody Died	KT2B	experiences of a first-time contester	Dec 40
Publish Or Perish	N1BLH	how to do a club newsletter	Jul 48
Some Guys Make It	K2ORS	classic humor from 73's cellar	Jun 46
The Day the Aliens Landed in Limerick, Maine	W1ROM	the ultimate eyeball QSO	May 38
The Dayton Hamvention '86	WA4BPI	preview of attractions	Apr 20
The End of the Rope	K9AZG	the 1986 Ham Humor Award winner	Oct 38
The Potabilities Are Endless!	KA7AWD	how to pot a project	Apr 57
This Pileup's For You!	K2SDD	how to generate them	Dec 46
Total Solar	WB8VGE	turn sunshine into sine waves	May 60
Troubleshooting With the DMM	Davidson	step-by-step tutorial	Jul 58

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A Pedal-Pushing Power Plant	WA8WTE	bicycle power generator	Nov 50
Faster Than A Patch, It's Speed Dialer	K7UKW	one-button autodialer	Mar 20
Hams In Space	KW1O	W5LFL and W8ORE talk about their flights	Jun 34
Kit Corner: the DSE Radio Direction Finder	Swain	Australian RDFing	Jul 64
Radio to Go	WB8WPY	inexpensive VOX headset	May 68
The Missing Link	WB2REM	HT control of your HF station	Sep 42
The Ramada Radiator	WA8WVF	$10 all-band portable antenna	Sep 52
132 Extra Memories for Your FT-107M	LU2HP/ON6JC	three cents per	Mar 32

Modifications

Agc, PDQ	KX6E	simple add-on agc	May 66
Army Surplus CW	W8MFL, WL7AKZ	the Special Forces PRC-64	May 36
Build a Dynamic Duo	VE1VQ	speaker/mike and 12-V adapter for your HT	Feb 40
Double Your Computing Power!	NO8M	add a second keyboard to your CoCo	Jan 50
Everybody Equalize!	K9EID	optimizing microphone response	Dec 44
Genius Brings Home the Bacon	Phenix	the Mobius antenna takes on a new twist	Jul 52
Make The Switch	WB2JJX	add WARC bands to your boat anchor	Dec 26
New Bands for Old Rigs	GW3SB	add three WARC bands onto your boat anchor	Feb 16
Radio to Go	WB8WPY	inexpensive VOX headset	May 68
Razzle-Dazzlin' Your Azden	K7UKW	multi mode for the PCS-2000	Feb 20
Rebirth of the Eico 221	W5VTJ	super-sensitive surplus voltmeter	Feb 51
Run Silent, Run Beep	PY2AUC	scan indicator for the FT-227RB	Jan 40
Scanning the TR-2400	WB8IKO	quick and dirty	Feb 42
The Piggy-Bank Patch	KT2B	autopatch for the Piggy-Bank repeater	Jul 40
The RIT Stuff	K1NYX	RIT for the FT-101E	Feb 44
Those Tantalizing Twos	AL7DS	scanning for the IC-2AT and -02AT	Jun 60
Up, Down, and All Around	WA2AXO	scanning for the KDK 2016A	Feb 36
VIC RAMification: Part III	W6LOB	more RAM for your VIC-20	Feb 26
WARC, Reet, and Play	K7KQ	add 10 MHz to the FT-101Z	Feb 62
What You See is Where You're At: Part II	WA8YKN	universal digital frequency display	May 54

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20Ace Communications		IECS-200 communication system	Jul 21
Advanced Computer Controls		RC-850 software	Apr 18
Advanced Design Networks		Microloop antennas	Aug 23
AEA		PK-232 multimode controller	Aug 22
Aluma Tower		communication tower	Jul 20
Amateur Packet Alaska		APA VHF/UHF Switch	May 18
Antenna Specialists		mobile CB antennas	Sep 21
Antenna Specialists		sector antennas	Dec 18
Antique Electronic Supply		one-tube radio kit	Jan 76
A.P.E.		desoldering tools	Apr 19
A.P.E.		Micro-Clean	Nov 18
A.P.E.		PCB repair kit	Jul 20
ARCsoft		1986 Space Satellite Handbook	Jan 76
Bird Electronic		catalog	Jul 21
C. Itoh		color DMPs	Sep 20
Cambridge Airadio		air traffic guide	Dec 19
CCIE Manufacturing		Commander II VHF amp	Dec 19
Celwave		mobile catalog	Aug 22
CES		BeamCalc Software Toolbox	Jan 76
Coaxial Dynamics		meters	Jul 21
Communications Specialists		DI-16 surge suppressor	Feb 67
Communications Specialists		TS-32HBH encoder/decoder	Apr 18
Computer Aided Instructional Systems		Teledraw	Aug 23
Contact East		tool catalog	Feb 66
Crowley Manufacturing		Delta-Zulu IC-2AT case	Jan 77
Cushcraft		arrestors	Sep 20
Davie Tech		CO-AX3 cable stripper	Jul 21
Davie Tech		CTK-8 crimping kit	Jan 76
Davie Tech		PRB-50 digital logic probe	Oct 17
Davie Tech		tool cases	Nov 19
Diamond Systems		ham tests	Nov 18
Dick Smith Electronics		Australia I satellite receiver kit	Jan 76
E.F. Johnson		Challenger mobile radios	Aug 22
Electronic Specialists		Modem/Power/Static Pac	Feb 66
Electronic Specialists		PDS-11 modem protection	Dec 18
Electronic Specialists		UPS	Apr 18
Encomm		Santec ST-20T	Jan 76
Etron Enterprises		Rf Notes 2 software	Mar 65
Etron Enterprises		Rf Notes 3 software	Jun 18
Everett/Charles		Super Modem 1200	Jan 76
Fox Tango		newsletter index	May 18
Girard Electronics		Protoflex-III	Nov 19
Grove Enterprises		Communications Satellites	Dec 19
Grove Enterprises		Monitoring Times	Mar 65
Grove Enterprises		Omni antenna	Mar 64
Grove Enterprises		Scanner Beam	Feb 66
Grove Enterprises		The Listener's Handbook	Mar 65
Hamilton and Area Packet Network		IBM PC packet adapter	Apr 18
Hamtronics		catalog	Jul 21
Hamtronics		GaAsFET preamps	Feb 66
Hamtronics		low-band preamps	May 19
Heathkit		catalog	Oct 17
Heathkit		HD-1422 antenna noise bridge	Feb 66
Heathkit		HW-8502 transceiver	Apr 18
Howard Sams & Co.		Basic Electricity series	May 18
Howard Sams & Co.		Commodore ham software	Dec 19
Howard Sams & Co.		IC Op-Amp Cookbook	Oct 16
ICOM		IC-A2 accessories	Sep 21
ICOM		IC-03AT and IC-u2AT	Nov 18
ICOM		IC-28A/28H mobiles	Jun 18
ICOM		IC-48A	Aug 22
ICOM		IC-751A HF transceiver	May 16
International Radio		8-pole crystal filters	Aug 22
J.S. Technology		sinadaptor	Sep 20
Jensen Tools		JTK-84 tool kit	Nov 18
Jensen Tools		tool catalog	Jun 18
Jensen Tools		tool catalog	Nov 19
Kalglo		LS250 UPS	Jun 18
Kalglo		Mini-II surge suppressor	Feb 66
Kantronics		KPC-2 TNC	Apr 19
Kaul-Tronics		mesh antenna	Nov 18
KB1T Radio Specialties		photo calendar	Nov 19
Kenwood		R-5000	Nov 18
Kenwood		TM-2570A/2550A/2530A	Feb 66
Larsen		KG-450 antenna	Jun 18
Larsen		Kulduckie 2m portable whip	Jul 20
Larsen		YA5 yagis	Sep 20
Lynx		QC-100 cable-tie tool	Jul 20
MFJ		Video Effects Titler	Jan 76
Meadowlake		TEC-200 image film	Jan 76
Medford Specialized Services		aluminum blazing rod	Jun 18
Mercer Electronics		9120 VOM	Jun 19
Mercer Electronics		9310 DMM	Oct 17
Mercer Electronics		9340 pocket DMM	Dec 18
Mercer Electronics		9370 digital multimeter	Aug 22
Metz		stainless-steel antenna systems	May 19
Microwave Modules		MML 144/200S amplifier	Apr 18
Microwave Modules		MMT144/28R multimode transverter	Jan 77
Midland		16-channel HT	Feb 66
Miracle Rod		brazing rods	Aug 23
Mirage/KLM		1260 beam	Oct 16
Multibotics		robotics workshops	Jul 20
NES		Slimline ohmmeter	Mar 64
Naval Electronics		voice-operated squelch	Oct 16
Nel-Tech Labs		digital voice keyer	Sep 20
Nemal		connectors	Jun 19
Ohm/Electronics		Scooter surge protector	Nov 18
Orion Hi-Tech		RC5A antenna rotators	Jul 20
Ovonic		Compact Silent Generator	Jun 18
P.C. Electronics		GaAsFET ATV downconverter	Sep 20
PacComm		TNC-200	Feb 66
Palomar Engineers		Tuner Tuner	Sep 21
R. A. Kent		Morse key kit	Jul 21
Radio Engineers		oscilloscope frequency extenders	Oct 16
Rapid Systems		4X4 digital oscilloscope	Oct 16
Rapitech Systems		Acticon connector	Jun 18
Regency Electronics		HX1200 scanner	Apr 18
Regency Electronics		HX1500 scanner	Oct 17
Regency Electronics		MX-5500 scanner	May 18
Resultant Engineering		R-2000 repeater controller	Jul 21
Seico Products		custom-printed knobs and dials	Aug 22
Selectone		CTCSS encoder/decoder	Jul 21
Selectone		ST-13U Digitone CTCSS encoder	Jan 76
Sencore		Z-Meter 2	Jul 20
Shure Brothers		550L microphones	Oct 16
Sibex		610 oscilloscope memory	Jul 20
Sony		ICF-2010	Dec 19
Standard Communications		RP70K	Dec 18
Stone Mountain Engineering		757 QSYer	Dec 19
TAB Books		DX Power: Effective Techniques for Radio Amateurs	May 18
Technigroup		TravelComm 1200	Aug 23
Torontel		SSTV system	Nov 18
Trio Technology		PC Code-Pro	Dec 19
Uncle Bill's Fine Software		antenna design package	Mar 65
Uncle Bill's Fine Software		Commodore code course	Mar 64
VoCom		power amps	Feb 66
Winner's Edge Software		Contester II	May 18
Winner's Edge Software		CQWW module	Oct 17
Wm. M. Nye		QRG Display	Jul 21
Xcelite		coaxial stripper	Oct 17
Xcelite		crimper	Dec 18
Xcelite		cutting pliers	Nov 19
Yaesu		AD-2 Duplexer	Sep 21
Yaesu		FT-767GX	Aug 22
Yaesu		YS-60/500 meters	Mar 65

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A Better Money-Maker	WA6TTY	13.8-V 20-Amp power supply	Jan 42
A Pedal-Pushing Power Plant	WA8WTE	bicycle power generator	Nov 50
A Power Supply Primer: Part I	K4IPV	everything you need to know about dc	Nov 26
Total Solar	WB8VGE	turn sunshine into sine waves	May 60

Receiving

A Connoisseur's Microwave Converter	Harry	cheap and good	Apr 45

Agc, PDQ	KX8E	simple add-on agc	May 66
Hait That Hum!	WA4WDL	filter for 60-Hz hum	Mar 17
Just the FAX, Ma'am	WB8TPD	one-chip WEFAX decoder for the C-64	Oct 24
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AEA	K9EI	PK-64 PAKRATT	Feb 72
Alinco Electronics	KT2B	ELH-220GF power amplifier	Nov 20
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Dick Smith Electronics	KT2B	Commander VHF FM transceiver	May 26
Dick Smith Electronics	WB6PHE	100-W VHF amplifier kit	Nov 22
Dick Smith Electronics	WB6PHE	440-MHz mobile transceiver	Oct 18
G.W. Morse Keys	VE7BS	PEP/B conversion module	Feb 73
Gary Field	KR3T	WA1GRC TPS-1 power-supply kit	Feb 73
Heathkit	N1BLH	HD-3030 interface	Jul 23
Heathkit	N1BLH	HO-5404 station monitor	Sep 24
Heathkit	N1BLH	HOA-5404-1 Pan Adapter	Oct 20
Heathkit	KW1O	HS-148 computer	Dec 22
Heathkit	Danzer	IO-4225 oscilloscope	May 22
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Horse Sense Software	KW1O	Radio Interference Analysis	Jan 68
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ICOM	KT2B	IC-1271A 23-cm multimode	Sep 22
ICOM	W1XU	IC-27A	Jan 70
ICOM	KT2B	IC-471A	Jun 20
Isotron	KF4PW	160m antenna kit	Mar 56
Kenwood	KT2B	TH-31AT	Jul 22
Kenwood	KT2B	TS-811A	Jun 20
Kit Corner: Build A Two-Tube Vintage Receiver	Whitby		Sep 66
Kit Corner: The DSE 500-MHz Frequency/Period Counter	KW1O		Aug 90
Lance Johnson Engineering	KW1O	Kansas City Keyer	Mar 56
MFJ	N1BLH	MFJ-1207 TNC-2	Jun 24
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Mirage/KLM	KT2B	C22 A power amplifier	Nov 20
Nel-Tech	WB6BTH	DVK-100 digital voice keyer	Dec 20
Regency Electronics	N1BLH	MX-7000	May 20
SSB Electronics	KT2B	MV 220 preamplifier	Apr 84
SSB Electronics	KT2B	PA2310 power amplifier	Apr 83
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Triangle Electronics Laboratories	KF4PV	MK-800 memory keyer	Jan 68
Twin Oaks Associates	WD9EDT	C.W. Tutorsoft and C.C. Testmaster	Feb 72
Uniden-Bearcat	N1BLH	600XTL	May 20
Yaesu	WB9LSS	FT-209RH HT	Jan 66
73's Packet Buying Guide	Staff	goodies and where to get them	Aug 88

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And If That Isn't Enough...	NK6K	packet Q&A	Aug 80
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How To Make Friends At 1200 Baud	W2JUP	operating packet	Aug 34
On The Shelf	NK6K	packet bibliography	Aug 86
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Roll A RTTY Scope	WA8MRG	tuning indicator with built-in CRT	Jul 28
Seeing Packet Radio With Different Eyes	N7FDS	how a blind ham copes with packet	Aug 48
So You Want To Be A Sysop?	WB2MNF	secrets of a successful packet BBS	Aug 50
Survival Training For Mountaintop Digipeaters	WB8RAL	practical tips	Aug 68
Terminal Teletype	W3RWU	RTTY for the H-89	Apr 62
The Perfect RTTY Filter	WA8MRG	less than $10	Jan 46
Working 2tCTU	WB8OMK	two-chip RTTY TU	Jan 54

Test Gear

Don't Be A Kamikaze!	KA4J	improvement on the suicide cord	Mar 30
Rebirth of the Eico 221	W5VTJ	super-sensitive surplus voltmeter	Feb 51
Rock Solid Rf	Ociepka	PLL-based frequency synthesizer	Apr 74
Roll A RTTY Scope	WA8MRG	tuning indicator with built-in CRT	Jul 28
Subaudible Snooping	KE6VK	very-low-frequency counter	Nov 48
They Threw What Away?	WA8WTE	surplus UHF swr bridges	Jun 58
Troubleshooting With the DMM	Davidson	step-by-step tutorial	Jul 58
Your Bridge Over Troubled Antenna Tuning	W3MT	matching box	Apr 24

Theory

A Packet Primer	W1BEL	the mechanics of packet	Aug 28
A Power Supply Primer: Part I	K4IPV	everything you need to know about dc	Nov 26
A Simple Way to Measure SSB PEP	W5VSR	use a little common sense	Oct 40
And If That Isn't Enough...	NK6K	packet Q&A	Aug 80
Are Sine Waves Sacred?	W6HDM	the benefits of trapezoidal power	May 44
Beyond Level Two	KA9Q	packet networking	Aug 74
Birds 'N' Bauds	NK6K et al	flying packet satellites	Aug 58
Build A Digital IC Trainer	WB4YOD/PW8ZAF	for the experimenter	Mar 40
Defuse RFI	W6WUZ	the coaxial ground revisited	Nov 32
Digital Simplex Repeaters	K4YKZ	a cross between packet radio and repeaters	Jun 48
Easy Digital Circuit Analysis	K5VKQ	Boolean algebra for the masses	Apr 66
Genius Brings Home the Bacon	Phenix	the Mobius antenna takes on a new twist	Jul 52
How To Make Friends At 1200 Baud	W2JUP	operating packet	Aug 34
Japan's Hush-Hush Rushbox	PA0SE	secret radio from WWII	Mar 9
Little or No Resistance	AJ0N	mysterious world of superconduction	Jan 36
Make the Switch to PIN Diodes	OA4KO/YV5	replace relays with silent diodes	Oct 28
Messing With Microwaves	Neal	construction techniques	Jun 52
New Bands for Old Rigs	GW3SB	add three WARC bands onto your boat anchor	Feb 16
No Free Lunches	W6HDM	perpetual motion update	Nov 42
On The Shelf	NK6K	packet bibliography	Aug 86
Resonant Wire Antennas	W8VM	random-length wires	Sep 60
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Scaling the Wet Noodle	W5RRH	modeling low-band antennas	Sep 40
Seeing Packet Radio With Different Eyes	N7FDS	how a blind ham copes with packet	Aug 48
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Super-Selectable Bandpass Filters	PA0SE	the ultimate i-f filter	Feb 54
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The Care & Feeding of a Curved Linear Array Antenna System	N6BIS	all-band trailer installation	Apr 30
The Match Maker	VE3LMP	what's all this about impedance matching?	Apr 38
Transistors On The Bias	W6WTU	how to bias transistor amps	Nov 40
Trap An Amazon Aerial	WB4YOD/PW8ZAF	home-brew your own traps	Sep 56
Troubleshooting With the DMM	Davidson	step-by-step tutorial	Jul 58
Watts My Line	K4IPV	Basic transmission line design program	Sep 36
Yesterday's Circuits Today	W6HDM	favorite tube circuits	Feb 28

Transmitting

A Simple Way to Measure SSB PEP	W5VSR	use a little common sense	Oct 40
A VOX In A Box	K1NYK	endless-loop CQer	Dec 34
Everybody Equalize!	K9EID	optimizing microphone response	Dec 44
Make The Switch	WB2JJX	add WARC bands to your boat anchor	Dec 26
Malley's Manchester Monitor	K1NYK	monitor your transmitted audio	Apr 66
Two to Ten	WB5IPM	transceiving converter	Jun 38
WARC, Rest, and Play	K7KQ	add 10 MHz to the FT-101Z	Feb 62

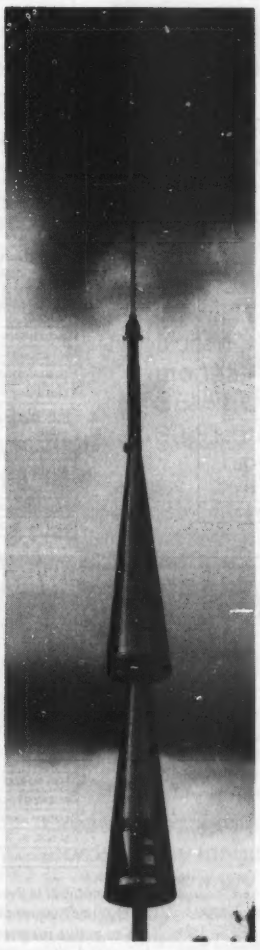
VHF/UHF

A Connoisseur's Microwave Converter	Harry	cheap and good	Apr 45
Antennas Should Be Heard, Not Seen	KC3HW	2m hidden J-pole	Apr 42
Birds 'N' Bauds	NK6K et al	flying packet satellites	Aug 58
Build a Dynamic Duo	VE1VQ	speaker/mike and 12-V adapter for your HT	Feb 40
Digital Simplex Repeaters	K4YKZ	a cross between packet radio and repeaters	Jun 48
Dishing It Out On 10 GHz	WB6IGP	microwave feeds and antennas	Sep 46
Faster Than A Patch, It's Speed Dialer	K7UKW	one-button autodialer	Mar 20
Messing With Microwaves	Neal	construction techniques	Jun 52
Microwave Building Blocks: The I-f Amplifier	WB6IGP	one tiny chip does it all	Oct 42
Nobody Died	KT2B	experiences of a first-time contester	Dec 40
Razzle-Dazzlin' Your Azden	K7UKW	multi mods for the PCS-2000	Feb 20
Run Silent, Run Beep	PY2AUC	scan indicator for the FT-227RB	Jan 40
Scanning the TR-2400	WB8IKO	quick and dirty	Feb 42
Speed-Charge Your PB-21	WA8IZV	fast charger for the TH-21	May 32
The Piggy-Bank Patch	KT2B	autopatch for the Piggy-Bank repeater	Jul 40
They Threw What Away?	WA8WTE	surplus UHF swr bridges	Jun 58
Those Tantalizing Twos	AL7DS	scanning for the IC-2AT and -02AT	Jun 60
Transmitter Hunters: Here's Your Ammo For Tracking	WB0CMC	ultra-sensitive 2m fox-hunter	May 50
Up, Down, and All Around	WA2AXO	scanning for the KDK 2016A	Feb 36

Put More Punch in Your Packet

Outstanding mechanical design makes the IsoPole the only logical choice for a VHF base station, especially for Packet operation. All isopole antennas yield the **maximum gain attainable** for their respective lengths and a maximum signal on the horizon. Exceptional decoupling from the feed line results in simple tuning and a significant reduction in TVI potential. The IsoPole antennas are all impedance matched in the factory so that no field tuning is required. The IsoPoles have the broadest frequency coverage of any comparable VHF base station antenna. This means no loss of power output from one end of the band to the other, when used with SWR protected solid state tranceivers. **Typical SWR is 1.4 to 1 or better across the entire band.**

A standard 50 Ohm SO-239 connector is recessed within the base sleeve (fully weather protected). With the IsoPole you will not experience aggravating deviation in SWR with changes in weather. The impedance matching network is weather sealed and designed for maximum legal power. The aerodynamic cones are the only appreciable wind load and are attached directly to the support (a standard TV mast which is not supplied).



High Performance Hand-Held Antenna — The Hot Rod

The Hot Rod antenna can be expected to make the same improvement to hand-held communications that the IsoPole antennas have made to base station operation. **Achieve 1 or 2 db gain** over ANY 5/8 wave two meter telescopic antenna. The factory tuned HR-1 is 20% shorter, lighter and places far less stress on your hand-held connector and case. It will easily handle over 25 watts of power, making it an excellent emergency base or mobile antenna. In the collapsed position, the Hot Rod antenna will perform like a helical quarter wave. Three Hot Rods are available; HR-1 1/2 wave 2M Ant., HR-2 for 220 Mhz, and HR-4 for 440 Mhz. Amateur Net Price on all Hot Rods is $19.95.

For either base station or hand-held operation AEA has the perfect VHF/UHF antenna. Put more punch in your Packet station with an AEA IsoPole or Hot Rod antenna. To order your new antenna contact your favorite Amateur Radio Distributor. For more information contact Advanced Electronic Applications, P.O. Box C-2160, Lynnwood, WA 98036, or call 206-775-7373.

IsoPole Specifications

Model	144	220	440
Freq. Coverage (Mhz)	135-160	210-230	415-465
2.1 VSWR bandwidth	›12Mhz @ 146Mhz	›15Mhz @ 220Mhz	›22Mhz @ 435Mhz
Power Rating	1 kw	1 kw	1 kw
Gain**	3 dbd	3 dbd	3 dbd
Radiating Element Length	125.5" (3.2m)	79.25" (2m)	46" (1.2m)
Amateur Net Price	$49.95	$49.95	$69.95

**dbd — db gain over a dipole in free space

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PROPAGATION

Number 21 on your Feedback card

Jim Gray W1XU

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
ARGENTINA	20	40	40	40	80	80				20	15	15
AUSTRALIA	20		20		40	40	20	20			15[1]	15[1]
CANAL ZONE	15	20	20	40	40		20	20	15	15	15*	15*
ENGLAND	20	40	80	40	40		20	20	20	20	20	20
HAWAII	20		20		40	40	80	20			15[1]	15[1]
INDIA	20[1]					20[1]	40[1]	20[1]				15[1]
JAPAN	20						20	20				20
MEXICO	15	20	20	40	40		20	20	15	15	15*	15*
PHILIPPINES							20					
PUERTO RICO	15	20	20	40	40		20	20	15	15	15*	15*
SOUTH AFRICA			40[1]	40[1]				15	15	15	20	20
U. S. S. R.	40	80	80	40			20	20	20			40
WEST COAST		80	80	40	40	40	20	20	20			

CENTRAL UNITED STATES TO:

ALASKA						80*	40*	20				
ARGENTINA	20		40	40	40						15	15
AUSTRALIA	15					40	20	20	20			15
CANAL ZONE	20	80	40	40	40	40	20	20	15	15	15	20
ENGLAND	40	40	40	80				20	15	20		40
HAWAII	15	20			40	40	40				15	15
INDIA	15[1]	20[1]	20[1]				40[1]	20[1]	20[1]			
JAPAN						80*	40*	20				
MEXICO	20	80	40	40	40	40	20	20	15	15	15	20
PHILIPPINES								20				
PUERTO RICO	20	80	40	40	40	40	20	20	15	15	15	20
SOUTH AFRICA	20	40*							15	15	20	20
U. S. S. R.	40		40	40				20	20			

WESTERN UNITED STATES TO:

ALASKA	15	20			40	40	40	40	40			20
ARGENTINA	15	20		40	40	40	40	40		15	15	15
AUSTRALIA	15	20	20				40	80*	40	15	15	15
CANAL ZONE	20	20		40	40	40			20	15	15	15
ENGLAND			80*	40					20	20		
HAWAII	15	15			20	20	20	20				15
INDIA		20										
JAPAN	15	20			40	40	40	40	40			20
MEXICO	20	20		40	40	40			20	15	15	15
PHILIPPINES	15	20					40	40		20		20
PUERTO RICO	20	20		40	40	40			20	15	15	15
SOUTH AFRICA	20	40[1]	40[1]							15	15	20
U. S. S. R.		40[1]	40[1]	40[1]	40[1]				20	20		
EAST COAST		80	80	40	40	40	20	20	20			

December is the solar cycle minimum, and HF propagation will be poor on the higher frequencies, with early band closings on and above 14 MHz. Unsettled to active magnetic field conditions will cause fair daytime conditions where noted. Magnetic storm levels may be reached on the 4th through the 6th, resulting in very bad propagation on east-west paths. North-south paths could be interesting. Look for unusual ionospheric propagation on 6 meters and above during the first week.

DECEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
	1 F	2 P	3 F-P	4 P	5 P	6 P
7 P-F	8 F-G	9 F	10 G	11 G	12 G	13 G
14 F-P	15 P	16 P-F	17 G	18 G	19 G	20 G
21 G	22 F	23 F-P	24 P	25 P-F	26 F	27 G
28 G	29 G	30 G	31 G			

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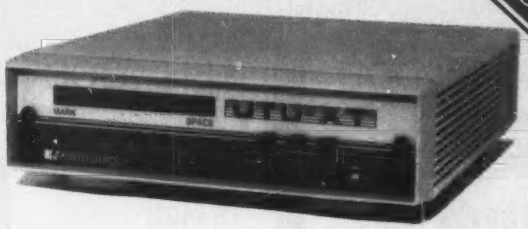

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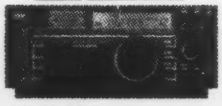

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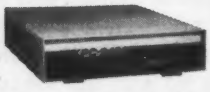

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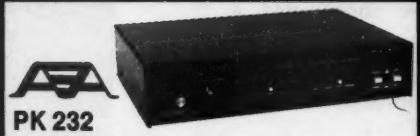

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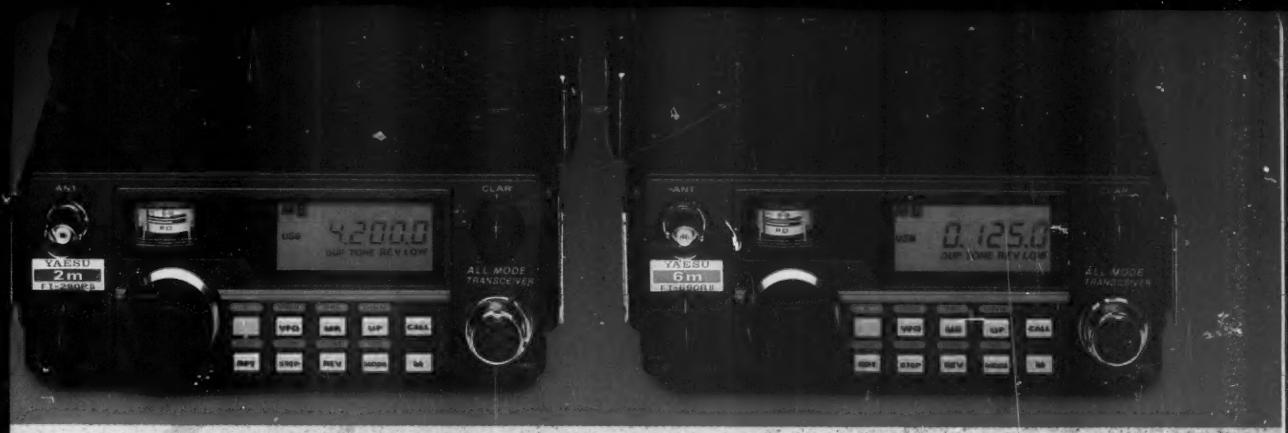

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- Extended frequency coverage for certain MARS and CAP operations.
- 3 memory channels store frequency and offset. And so easy to use! Simply press the memory channel number to recall your favorite channels!
- Night light, offset/reverse.
- 16-key DTMF pad for repeater autopatch is standard.

- NEW! Twist-Lok Positive-Connect™ battery case. A wide range of quick-change commercial duty battery packs are available.

- 12 VDC input terminal—allows direct mobile or external power supply operation. When 12 VDC is applied, power output increases to **5 watts!**
- Heavy-duty final amplifier and heat sink. The die-cast rear panel assures reliable operation. With the optional 12-volt PB-1 battery pack, the TH-205AT provides 5 W output. The standard 8.4 volt PB-2 provides 2.5 W output. (300 mW low power).
- Large, easy-to-read LCD display. Frequency, offset, memory channel, TX, RX, and battery indicator.
- Frequency UP/DOWN keys. Used to select frequency or scanning direction.
- Scan function key.
- Automatic battery saver circuit extends battery life. No buttons to push!
- Supplied accessories include: Rubber flex antenna, belt hook, 8.4 V, 500 mAH NiCd battery pack, wall charger.

Optional Accessories:

1) PB-1 12 V 800 mAh NiCd batt. pack (5 W output). **2)** PB-2 8.4 V 500 mAh NiCd batt. pack (2.5 W output). **3)** PB-3 7.2 V 800 mAh NiCd batt. pack (1.5 W output). **4)** PB-4 7.2 V 1600 mAh NiCd batt. pack (1.5 W output). **5)** BT-5 AA manganese/alkaline battery case. **6)** BC-7 Rapid charger for PB-1, 2, 3, or 4. **7)** BC-8 Battery charger for PB-1, 3 or 4. **8)** SMC-30 Speaker microphone. **9)** SC-12, SC-13 Soft cases. **10)** RA-3, RA-5 Telescoping antennas. **11)** RA-8B StubbyDuk antenna • TSU-3 CTCSS encode/decode unit • VB-2530 2 m, 25 W RF power booster • LH-4, LH-5 Leather cases • MB-4 Mobile bracket • BH-5 Swivel mount • PG-2V DC cable • PG-3C Filtered cigar lighter cord.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation.